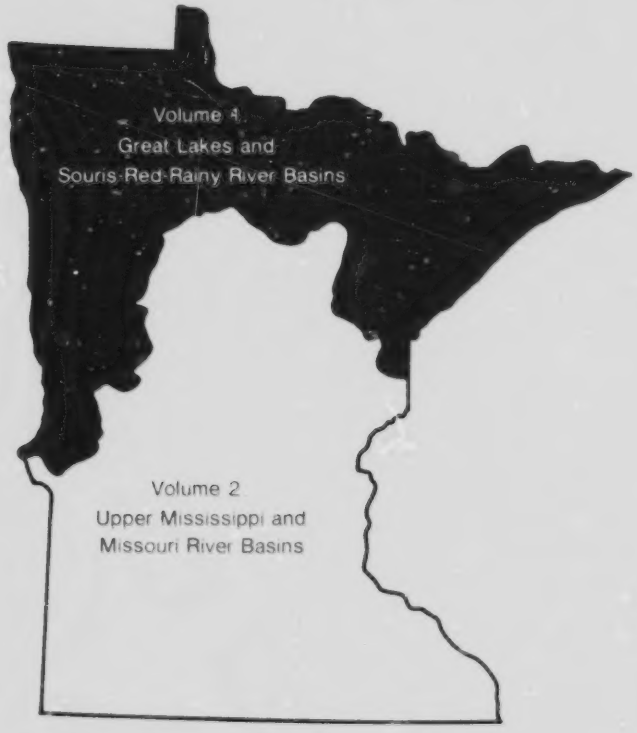
AUG 30 '88
619-E-23
COMPLETED
223

Water Resources Data Minnesota Water Year 1983

ORIGINAL

Volume 1. Great Lakes and Souris-Red-Rainy River Basins



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-83-1

Prepared in cooperation with the Minnesota Department of Natural Resources, Division of Waters; the Minnesota Department of Transportation; and with other State, municipal, and Federal agencies

BEST COPY AVAILABLE

CALENDAR FOR WATER YEAR 1983

1982

OCTOBER

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

NOVEMBER

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

DECEMBER

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

1983

JANUARY

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

FEBRUARY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28					

MARCH

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

APRIL

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

MAY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

JUNE

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

JULY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

AUGUST

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

SEPTEMBER

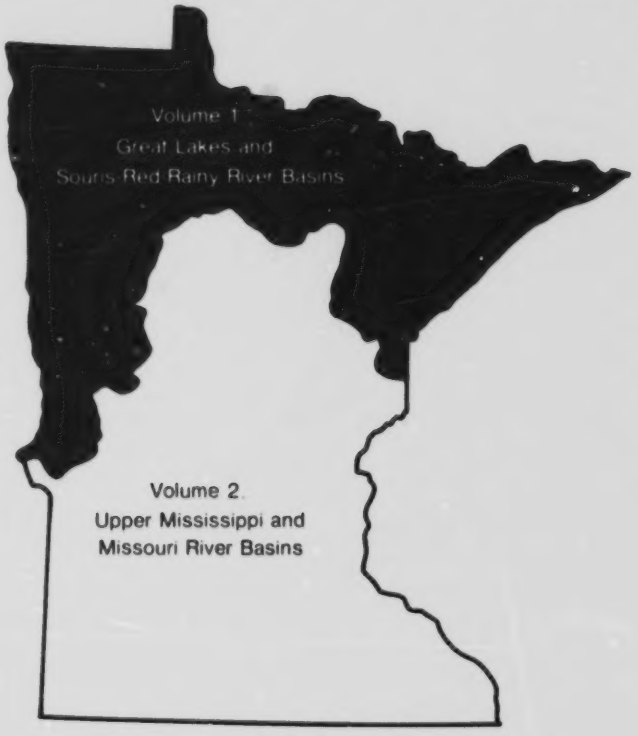
S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

BEST COPY AVAILABLE

Water Resources Data Minnesota Water Year 1983

Volume 1. Great Lakes and Souris-Red-Rainy River Basins

by Kurt T. Gunard, Joseph H. Hess, James L. Zirbel, and Charles E. Cornelius



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-83-1
Prepared in cooperation with the Minnesota Department of Natural Resources, Division of Waters; the Minnesota Department of Transportation; and with other State, municipal, and Federal agencies

I

BEST COPY AVAILABLE

UNITED STATES DEPARTMENT OF THE INTERIOR

WILLIAM P. CLARK, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information write to:

District Chief, Water Resources Division
U.S. Geological Survey
702 Post Office Building
St. Paul, Minnesota 55101

1984

II

BEST COPY AVAILABLE

PREFACE

This volume of the annual hydrologic data report of Minnesota is one of a series of annual reports that document hydrologic data gathered from the U.S. Geological Survey's surface- and ground-water data-collection networks in each State, Puerto Rico, and the Trust Territories. These records of streamflow, ground-water levels, and water quality provide the hydrologic information needed by State, local, and Federal agencies, and the private sector for developing and managing our Nation's land and water resources. Hydrologic data for Minnesota are contained in two volumes:

Volume 1. Great Lakes and Souris-Red-Rainy River Basins
Volume 2. Upper Mississippi and Missouri River Basins

This report is the culmination of a concerted effort by dedicated personnel of the U.S. Geological Survey who collected, compiled, analyzed, verified, and organized the data, and who typed, edited, and assembled the report. In addition to the authors, who had primary responsibility for assuring that the information contained herein is accurate, complete, and adheres to Geological Survey policy and established guidelines, the following individuals contributed significantly to the preparation of this report:

Donald W. Ericson, Subdistrict Chief, Grand Rapids, Minnesota
Mark R. Have, Water-Quality Specialist, Minnesota District
Henry W. Anderson, Jr., Ground-Water Project Chief, Minnesota District

Most of the data were collected, processed, and tabulated by the following individuals:

Allan D. Arntson
David J. Bauer
William D. Bemis
Ruth E. Bergstrom
Howard D. Braden
Alex Brietkrietz
John L. Callahan
Paul E. Felsheim
Patrick J. Finnegan
William A. Gothard
Jeffrey L. Henry
Jerry K. Hicks
Roderick L. Johnson
David L. Lorenz
Gregory R. Melhus
Gregory B. Mitton
Luanne Nelson
Charles J. Smith
Gregory W. Stratton
Lan H. Tornes
Duane A. Wicklund
Tillie L. Yocus
Anne M. Weaver

Jo Anne A. Jannis typed the text of the report.

This report was prepared in cooperation with the State of Minnesota and with other agencies under the general supervision of Donald R. Albin, District Chief, Minnesota.

BEST COPY AVAILABLE

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. USGS/WRD/HD-85/214	2.	3. Recipient's Accession No.
4. Title and Subtitle: Water Resources for Minnesota, Water year 1983 Volume 1, Great Lakes and Souris-Red-Rainy River Basins			5. Report Date: February 1985 6.
7. Author(s): Kurt T. Gunard, Joseph H. Hess, James L. Zirbel, and Charles E. Cornelius			8. Performing Organization Rept. No.
9. Performing Organization Name and Address: U.S. Geological Survey, Water Resources Division, 702 Post Office Building, St. Paul, Minnesota 55101			10. Project/Task/Work Unit No. USGS-WRD-MN-83-1 11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address: U.S. Geological Survey, Water Resources Division, 702 Post Office Building, St. Paul, Minnesota 55101			13. Type of Report & Period Covered: Annual Oct. 1, 1982 to Sept. 30, 1983 14.

15. Supplementary Notes

Prepared in cooperation with the State of Minnesota and with other agencies.

16. Abstract (Limit: 200 words)

Water-resources data for the 1983 water year for Minnesota consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This volume contains discharge records for 52 gaging stations; stage-only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 16 gaging stations, 1 stage station, 14 partial-record stations, and 18 wells; and water levels for 42 observation wells. Also included are 43 high-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data, together with the data in Volume 2, represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota.

17. Document Analysis a. Descriptors

*Minnesota, *Hydrologic data, *Surface water, *Ground water, *Water quality, Flow rate, Gaging stations, Lakes, Reservoirs, Chemical analyses, Sediments, Water temperatures, Sampling sites, Water levels, Water analyses, Data collection

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement: No restriction on distribution. This report may be purchased from National Technical Information Service, Springfield, VA 22161	19. Security Class (This Report): UNCLASSIFIED	21. No. of Pages: 210
	20. Security Class (This Page): UNCLASSIFIED	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

TK

BEST COPY AVAILABLE

CONTENTS

	Page
Preface	III
List of gaging stations, in downstream order, for which records are published	VI
List of ground-water wells, by county, for which records are published	VII
Introduction	1
Cooperation	1
Hydrologic conditions	2
Definition of terms	9
Downstream order and station number	15
Numbering system for wells and miscellaneous sites	15
Special networks and programs	16
Explanation of stage and water-discharge records	16
Collection and computation of data	16
Accuracy of field data and computed results	18
Other data available	18
Records of discharge collected by agencies other than the Geological Survey	18
Explanation of water-quality records	19
Collection and examination of data	19
Water analysis	19
Water temperature	19
Sediment	19
Explanation of ground-water level records	20
Collection of the data	20
Access to WATSTORE data	20
Publications on techniques of water-resources investigations	21
Discontinued gaging stations	22
Gaging-station records	30
Discharge at partial-record stations and miscellaneous sites	134
Low-flow partial-record stations	134
High-flow partial-record stations	136
Miscellaneous sites	143
Low-flow investigations of streams tributary to the Red River of the North	144
Analyses of samples collected at water-quality partial-record stations	146
Miscellaneous analyses of streams	163
Ground-water records	171
Ground-water level records	174
Quality of ground-water records	196
Index	199

ILLUSTRATIONS

Figure 1.	Map showing precipitation, in inches, during 1983 water year compared with normal annual precipitation for Minnesota	3
2.	Graph showing comparison of discharge at three long-term representative gaging stations for 1983 water year with median discharge for water years 1951-80	4
3.	Graph showing comparison of dissolved-solids concentrations for 1983 water year with mean monthly values for the period of record	6
4.	Map showing relationship of seasonal water-table levels to long-term mean levels	7
5.	Map showing relationship of seasonal water levels in confined aquifers to long-term mean levels	8
6.	Diagram showing system for numbering wells and miscellaneous sites	15
7.	Map showing location of water-discharge stations	26
8.	Map showing location of water-quality stations	28
9.	Map showing location of high-flow partial-record stations	136
10.	Map showing location of ground-water wells	172

BEST COPY AVAILABLE

Letter after station name designates type of data: (d) discharge; (e) gage height, elevation, or contents; (c) chemical, radio-chemical, or pesticides; (b) biological or micro-biological; (p) physical (water temperature, sediment, or specific conductance)

	Page
ST. LAWRENCE RIVER BASIN	
STREAMS TRIBUTARY TO LAKE SUPERIOR	
Pigeon River at Middle Falls, near Grand Portage....(d - - - p)...	30,163
Baptism River near Beaver Bay....(d - c b p)...	31,163
Knife River near Two Harbors....(d - - - p)...	37,163
St. Louis River:	
Partridge River above Colby Lake at Hoyt Lakes....(d - - - p)...	38,163
St. Louis River near Aurora....(d - - - p)...	42,163
St. Louis River at Forbes....(d - - - p)...	43,163
Stoney Brook at Brookston....(d - c b p)...	44,164
Simian Creek near Brookston....(d - c b p)...	46,164
Squaw Creek near Cloquet....(d - c b p)...	48,164
St. Louis River at Scanlon....(d - c b p)...	50,164
Otter Creek near Cloquet....(d - c b p)...	56,164
Nemadji River:	
Deer Creek near Holyoke....(d - - - p)...	58,164
HUDSON BAY BASIN	
Lake Winnipeg (head of Nelson River):	
RED RIVER OF THE NORTH BASIN	
Otter Tail River (head of Red River of the North):	
Orwell Reservoir near Fergus Falls....(- e - - -)...	59
Otter Tail River below Orwell Dam, near Fergus Falls....(d - - - p)...	60,164
Bois de Sioux River near White Rock, SD....(d - - - p)...	61,165
Red River of the North at Wahpeton, ND....(d - c - p)...	62
Red River of the North at Hickson, ND....(d - c - p)...	64
Red River of the North at Fargo, ND....(d - c - p)...	66
Red River of the North below Fargo, ND....(- - c - p)...	68
Buffalo River near Hawley....(d - - - p)...	69,165
South Branch Buffalo River at Sabin....(d - - - p)...	70,165
Buffalo River near Dilworth....(d - - - p)...	71,165
Wild Rice River at Twin Valley....(d - - - p)...	72,165
Wild Rice River at Hendrum....(d - - - p)...	73,165
Red River of the North at Halstad....(d - c b p)...	74
Marsh River near Shelly....(d - - - p)...	77,166
Sand Hill River at Climax....(d - - - p)...	78,166
Red Lake River:	
Lower Red Lake near Red Lake....(- e - - -)...	79
Red Lake River near Red Lake....(d - - - p)...	80,166
Red Lake River at Highlanding, near Goodridge....(d - - - p)...	81,166
Thief River near Thief River Falls....(d - - - p)...	82,166
Clearwater River at Plummer....(d - - - p)...	83,166
Lost River at Oklee....(d - - - p)...	84,167
Clearwater River at Red Lake Falls....(d - - - p)...	85,167
Red Lake River at Crookston....(d - c b p)...	86,167
Red River of the North at Grand Forks, ND....(d - c - p)...	91
Snake River:	
Middle River at Argyle....(d - - - p)...	93,144,167
Red River of the North at Drayton, ND....(d - c - p)...	94
Red River of the North at Emerson, Manitoba....(d - c b p)...	96
Roseau River below South Fork near Malung....(d - - - p)...	99,167
Roseau River below Roseau....(- - c b p)...	100,143
Roseau River at Roseau Lake....(- e - - -)...	101
Roseau River at Ross....(d - - - p)...	102,167
Roseau River below State ditch 51, near Caribou....(d - c b p)...	103,168
LAKE OF THE WOODS BASIN (head of Winnipeg River)	
Namakan River (head of Rainy River):	
Basswood River:	
Kawishiwi River near Ely....(d - c b p)...	109,168
Filson Creek near Ely....(d - - - p)...	112,168
Kawishiwi River near Winton....(d - - - p)...	113,168
Basswood River near Winton....(d - - - p)...	114,168
Namakan River at outlet of Lac la Croix, Ontario....(d - - - p)...	115,168
Vermilion River:	
Vermilion Lake near Soudan....(- e - - -)...	116
Vermilion River near Crane Lake....(d - - - p)...	117,168
Gold Portage Outlet from Kabetogama Lake near Ray....(d - - - p)...	118,168
Rainy Lake near Fort Frances, Ontario....(- e - - -)...	119
Rainy River:	
Little Fork River:	
Sturgeon River near Chisholm....(d - - - p)...	120,169
Little Fork River at Littlefork....(d - c b p)...	121,169
Big Fork River at Big Falls....(d - - - p)...	126,169

BEST COPY AVAILABLE

Page

LAKE OF THE WOODS BASIN (head of Winnipeg River)--Continued
Rainy River at Manitou Rapids.....(d - c b p)... 127,169
Rapid River near Baudette.....(d - - - p)... 132,169
Lake of the Woods at Warroad.....(- e - - -)... 133

GROUND-WATER WELLS, BY COUNTY, FOR WHICH RECORDS ARE PUBLISHED

BECKER
Well 138N41W17ADA01..... 174
Well 138N42W26CDA01..... 175
Well 138N43W18CDA01..... 175
Well 140N41W26CCD01..... 176
BELTRAMI
Well 149N31W25DCD01..... 176
Well 149N31W25DCD02..... 177
Well 156N31W36DAA02..... 177
CARLTON
Well 047N17W07AAB01..... 177
Well 048N17W02CCC01..... 178
Well 049N17W17ADD01..... 178
CLAY
Well 137N45W30CDB01..... 179
Well 139N47W05CDC01..... 179
Well 139N47W06AAA01..... 180
Well 139N48W11ABA01..... 180
GRANT
Well 128N43W21CBB01..... 181
Well 129N42W09CCC01..... 181
Well 130N44W25BCB01..... 182
ITASCA
Well 062N23W35BAB01..... 182
Well 148N25W08DDD01..... 183
KOOCHICHING
Well 066N27W24DAA01..... 184
Well 155N26W21DAA01..... 184
Well 155N26W21DAA02..... 185
LAKE OF THE WOODS
Well 161N34W18BCC01..... 185
MAHNOMEN
Well 144N42W20BBA01..... 186
MARSHALL
Well 155N47W11AAA03..... 186
Well 156N48W10DAA02..... 187
Well 157N48W27BAA01..... 187
OTTER TAIL
Well 134N41W08CCC01..... 188
Well 134N43W14ADB01..... 188
Well 136N39W23DCC01..... 189
Well 136N43W10AAA01..... 189
Well 136N43W22CDA02..... 189
Well 137N39W22ACD01..... 190
PENNINGTON
Well 154N43W33ADA01..... 190
ST. LOUIS
Well 057N20W05DAD01..... 191
Well 057N20W31DBC01..... 191
Well 058N18W12CCC01..... 192
Well 058N20W16DBC01..... 192
Well 060N13W01BBA01..... 193
Well 063N12W26ABB01..... 193
TRAVERSE
Well 129N47W25CDC01..... 194
WILKIN
Well 136N47W23CCC01..... 195

BEST COPY AVAILABLE

BEST COPY AVAILABLE

WATER RESOURCES DATA FOR MINNESOTA, 1983

INTRODUCTION

Water resources data for the 1983 water year for Minnesota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This volume contains discharge records for 52 gaging stations; stage only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 16 gaging stations, 1 stage station, 14 partial-record stations, and 18 wells; and water levels for 42 observation wells. Also included are 43 high-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements. These data, together with the data in Volume 2, represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota.

Records of discharge or stage of streams, and contents or stage of lakes and reservoirs were first published in a series of U.S. Geological Survey water-supply papers titled "Surface Water Supply of the United States." Through September 30, 1960, these water-supply papers were in an annual series and then in a 5-year series for 1961-65 and 1966-70. Records of chemical quality, water temperatures, and suspended sediment were published from 1941 to 1970 in an annual series of water supply papers titled "Quality of Surface Waters of the United States." Records of ground-water levels were published from 1935 to 1974 in a series of water-supply papers titled "Ground-Water Levels in the United States." Water-supply papers may be consulted in the libraries of the principal cities in the United States or may be purchased from Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202.

For water years 1961 through 1974, streamflow data were released by the Geological Survey in annual reports on a State-boundary basis. Water-quality records for water years 1964 through 1974 were similarly released either in separate reports or in conjunction with streamflow records.

Beginning with the 1975 water year, water data for streamflow, water quality, and ground water are published as an official Survey report on a State-boundary basis. These official Survey reports carry an identification number consisting of the two letter State abbreviation, the last two digits of the water year, and the volume number. For example, this report is identified as "U.S. Geological Survey Water-Data Report MN-83-1." Water-Data reports are for sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering reports may be obtained from the district chief at the address given on the back of the title page or by telephone (612) 725-7841.

COOPERATION

The U.S. Geological Survey and organizations of the State of Minnesota have had cooperative agreements for the systematic collection of streamflow records since 1909, for ground-water levels since 1948, and for water-quality records since 1952. Organizations that assisted in collecting data through cooperative agreement with the Survey are:

Minnesota Department of Natural Resources, Division of Waters, Lawrence D. Seymour, director.

Minnesota Department of Transportation, Richard P. Braun, commissioner.

Minnesota Pollution Control Agency, Thomas J. Kalitowski, executive director.

Metropolitan Waste Control Commission of the Twin Cities Area, Peter E. Meintsma, chairman.

Metropolitan Council of the Twin Cities Area, Sandra Gardebring, chairwoman.

Elm Creek Conservation Commission, Gerald E. Butcher, chairman.

Fond du Lac Reservation Business Commission, W. J. Houle, chairperson.

Red Lake Watershed District, Truman Sandland, president.

Middle River-Snake River Watershed District, Donald Rivard, chairman.

City of Eagan, Bea Blomquist, mayor.

Assistance in the form of funds or services was given by the Corps of Engineers, U.S. Army, in collecting records for 53 gaging stations and 19 water-quality stations published in this report.

Eleven gaging stations in the Hudson Bay and St. Lawrence River basins were maintained by funds appropriated to the United States Department of State. Eight of these, on waters adjacent to the international boundary, are maintained by the United States (or Canada) under agreement with Canada (or the United States), and the records are obtained and compiled in a manner equally acceptable in both countries. These stations are designated herein as "International gaging stations."

BEST COPY AVAILABLE

Some records for the Red River of the North, which borders the State on the west, were obtained at the request of other Federal agencies as a part of the program of the U.S. Department of the Interior for development of the Missouri River basin.

HYDROLOGIC CONDITIONS

PRECIPITATION AND STREAMFLOW

Normal annual precipitation in Minnesota ranges from 19 inches in the northwest to 32 inches in the southeast. The average annual runoff ranges from about 2 inches in the west to about 16 inches in the northeast. The 1983 water year began with rainfall considerably above normal statewide, becoming deficient during some months in winter, spring, and summer. Total annual rainfall was above normal to much above normal everywhere except in the west-central part of the State where rainfall was slightly below normal (fig. 1). Annual runoff in 1983 ranged from 0.04 inch in parts of the west-central area to about 21 inches in the northeast. Expressed as a percentage of average for the period of record, 1983 runoff ranged from 4 percent of average in parts of the west-central area to 440 percent of average in parts of the southwest where the annual runoff was almost 10 inches.

Records for stations in northern Minnesota indicate that runoff was above average during 1983. Runoff in Baptism River near Beaver Bay in northeast Minnesota, in Little Fork River near Littlefork in north-central Minnesota, and in Roseau River at Ross in northwest Minnesota was 21.15 inches, 9.00 inches, and 3.31 inches, respectively. Each of these values are 15 to 30 percent above the yearly average runoff. Figure 2 shows a comparison of monthly and annual mean discharges for these stations to median discharges for a 30-year base period.

Annual mean streamflow was below average at only two stations in the northwest and above average in the remainder of the northwest and in all the north-central and northeast areas. Departure from average streamflows, however, were not large enough to be considered either deficient or excessive. Monthly mean flows were excessive for some months at many stations.

No peaks of record were exceeded during 1983 at any gaging stations on streams for which records are published in this volume.

WATER QUALITY

Dissolved-solids data from selected NASQAN stations were used to show variations in water quality in the Great Lakes and Souris-Red-Rainy River basins. Normal concentrations of dissolved solids were sampled in northwestern Minnesota except those for Red Lake River at Crookston, which were higher than normal (fig. 3). Lower than normal concentrations were prevalent in the Great Lakes basin.

Some ground-water samples had properties or concentrations of chemical constituents that exceeded State limits recommended for raw water used for domestic consumption (Minnesota Pollution Control Agency, 1978). Limits were exceeded for turbidity in four samples and for arsenic, nitrate, and zinc in one sample each. Concentrations of total iron and total manganese were high in eight samples and seven samples, respectively, but no standards have been set for total iron or manganese. Recommended limits have been established for dissolved iron and manganese, but these values were not determined for any of the samples.

GROUND-WATER LEVELS

Water levels in unconfined (water-table) aquifers were above normal in a large part of Minnesota during the 1983 water year. Water levels generally were normal early in the water year, but rose during the year as a result of above-normal precipitation. Heavy rains in the fall and early snow cover, which prevented the ground from freezing in many areas of the State, resulted in above-normal recharge and above-normal water levels during the winter in the southeastern half of the State. Figure 4 shows how water levels relate seasonally to normal levels based on water-level fluctuations in 110 wells. Levels for the 1983 water year are compared to the long-term normal for each month and grouped by seasons. During fall, water levels generally were near normal, except in west-central Minnesota where they were below normal, and in southwestern Minnesota and the northwestern corner of the State where they were above normal. During winter and spring, water levels in the southeastern half of the State generally were above normal, and numerous seasonal record-high levels were recorded. Water levels in west-central Minnesota continued below normal, and one seasonal record low was recorded. During summer, water levels in southwest and in part of central Minnesota were nearly normal, but water levels in west-central Minnesota continued to be below normal in response to below-normal precipitation.

Water levels in confined drift and bedrock aquifers were normal or above in most of the State during all the 1983 water year. The seasonally high water levels in confined aquifers (fig. 5) reflect the effect of considerably above-normal precipitation and ground-water recharge during fall. Numerous seasonal record-high-water levels were recorded in northeastern, central, south-central, and southeastern Minnesota. Confined levels in west-central Minnesota were consistently below normal, and new seasonal record low levels were recorded. Levels in the Mount Simon-Hinckley aquifer in the Twin Cities basin were consistently below normal because of increased pumpage from the aquifer. Figure 5 shows how confined water levels relate seasonally to normal levels based on water-level fluctuations in 84 wells.

BEST COPY AVAILABLE

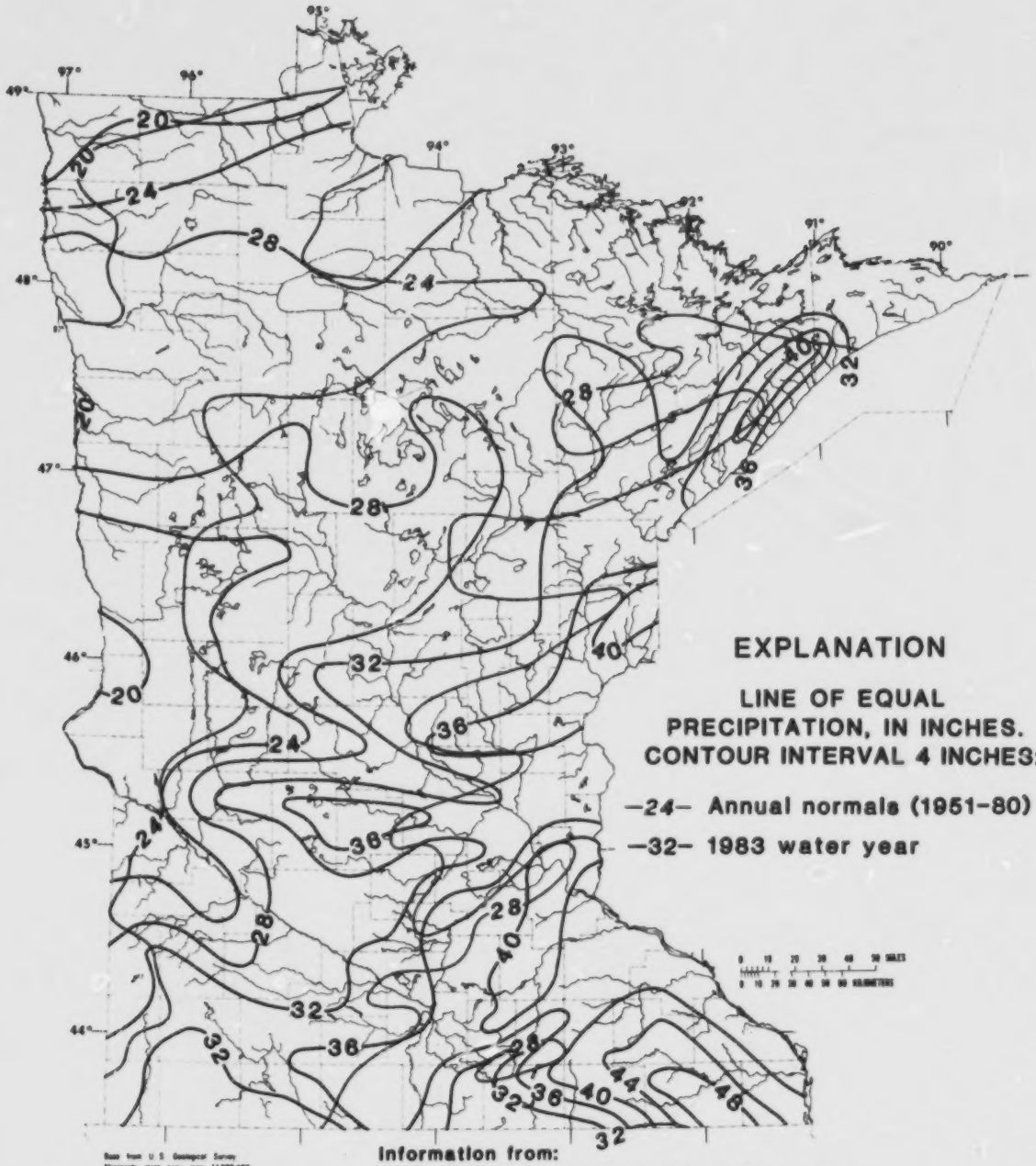

EXPLANATION
LINE OF EQUAL PRECIPITATION, IN INCHES. CONTOUR INTERVAL 4 INCHES:
—24— Annual normals (1951-80)
—32— 1983 water year
Information from:
Minnesota Department of Natural Resources,
State Climatology Office, and
Soil Science Department, University of Minnesota

Figure 1.--Precipitation, in inches, during 1983 water year compared with normal annual precipitation for Minnesota

BEST COPY AVAILABLE

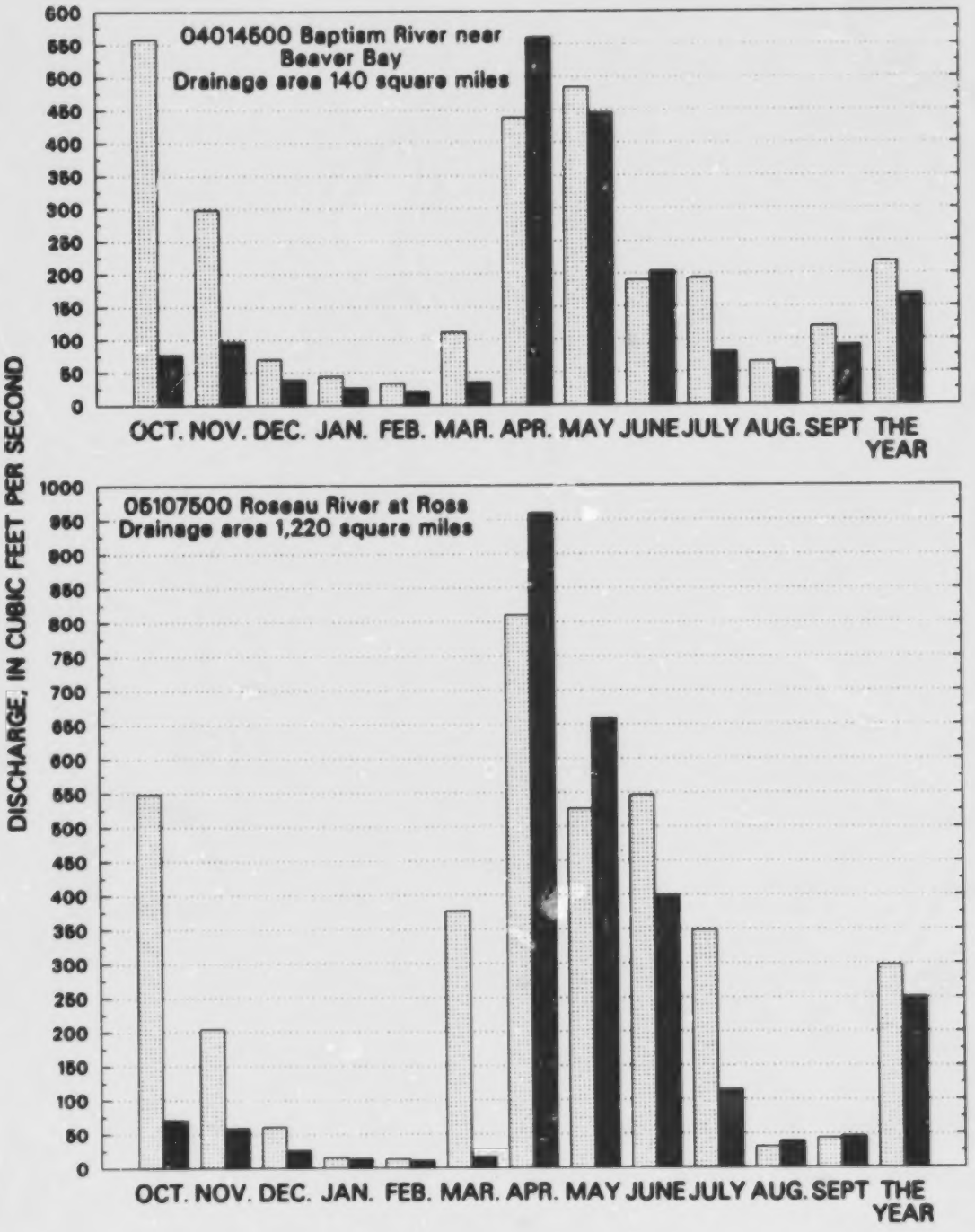
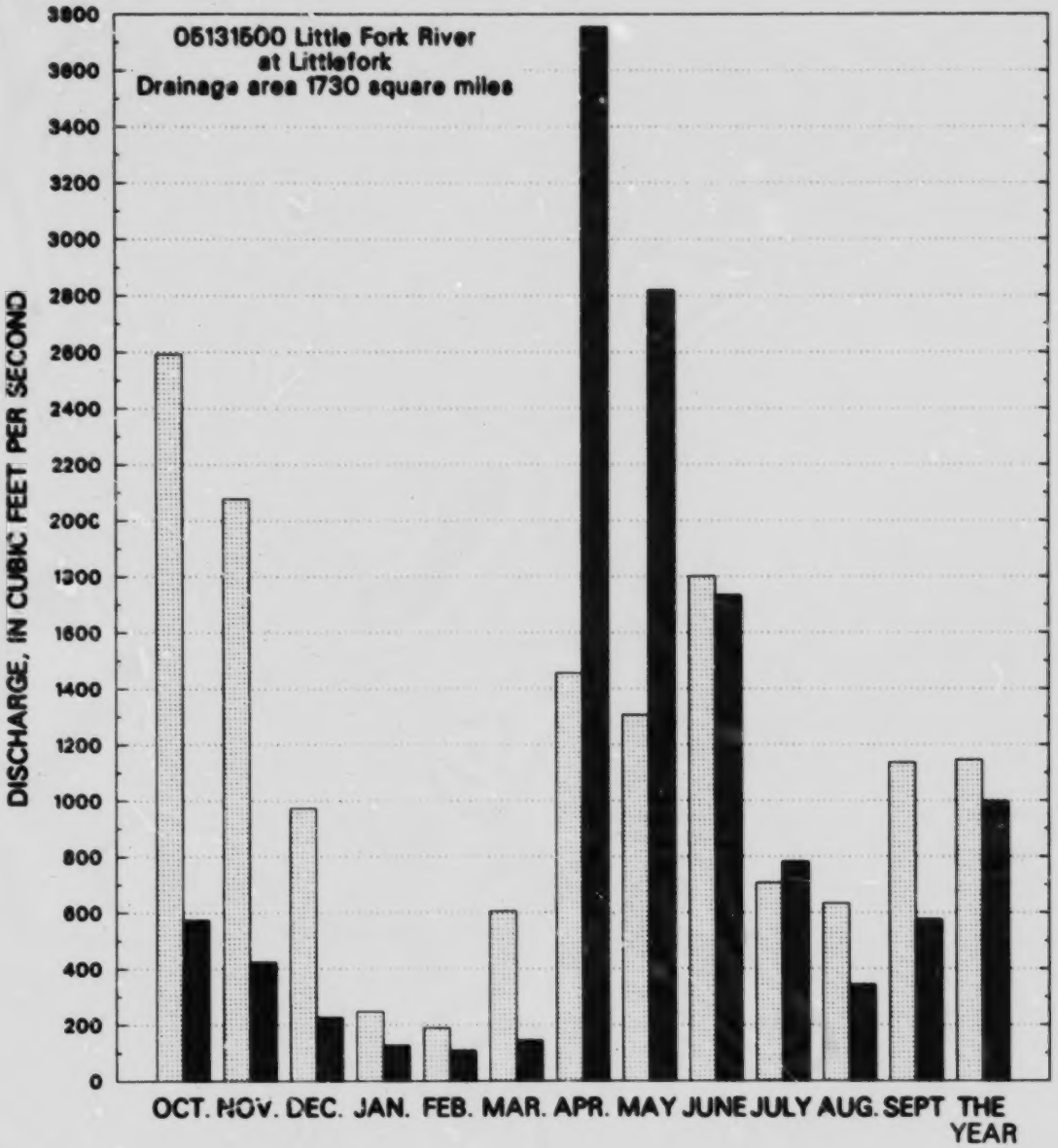

04014500 Baptism River near
Beaver Bay
Drainage area 140 square miles
05107500 Roseau River at Ross
Drainage area 1,220 square miles
DISCHARGE, IN CUBIC FEET PER SECOND
OCT. NOV. DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT THE YEAR

Figure 2.--Comparison of discharges at three long-term representative gaging

BEST COPY AVAILABLE



EXPLANATION

Monthly and yearly mean discharges during 1983 water year

Median of monthly and yearly mean discharges for water years 1951–80

stations for the 1983 water year with median discharges for a 30-year base period

BEST COPY AVAILABLE

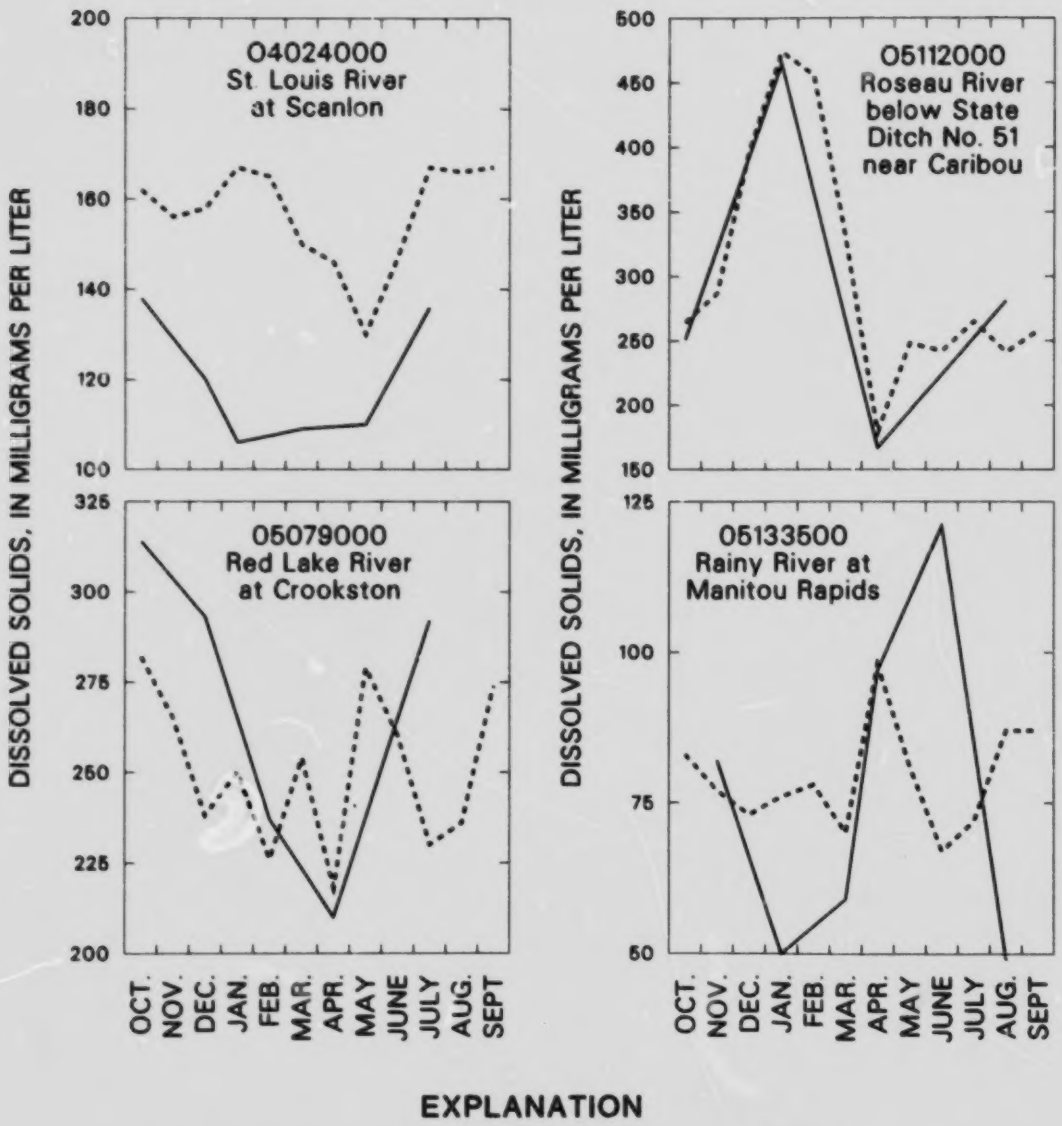


Figure 3.--Comparison of dissolved-solids concentrations for 1983 water year with mean monthly values for the period of record

BEST COPY AVAILABLE

1983 WATER YEAR

FALL
(October-December)

WINTER
(January-March)

SPRING
(April-June)

SUMMER
(July-September)

EXPLANATION

WATER-TABLE LEVELS

ABOVE NORMAL--water levels are within the highest 25 percent of record for the season

NORMAL

BELOW NORMAL--water levels are within the lowest 25 percent of record for the season

Figure 4.--Relationship of seasonal water-table levels to long-term mean levels

BEST COPY AVAILABLE

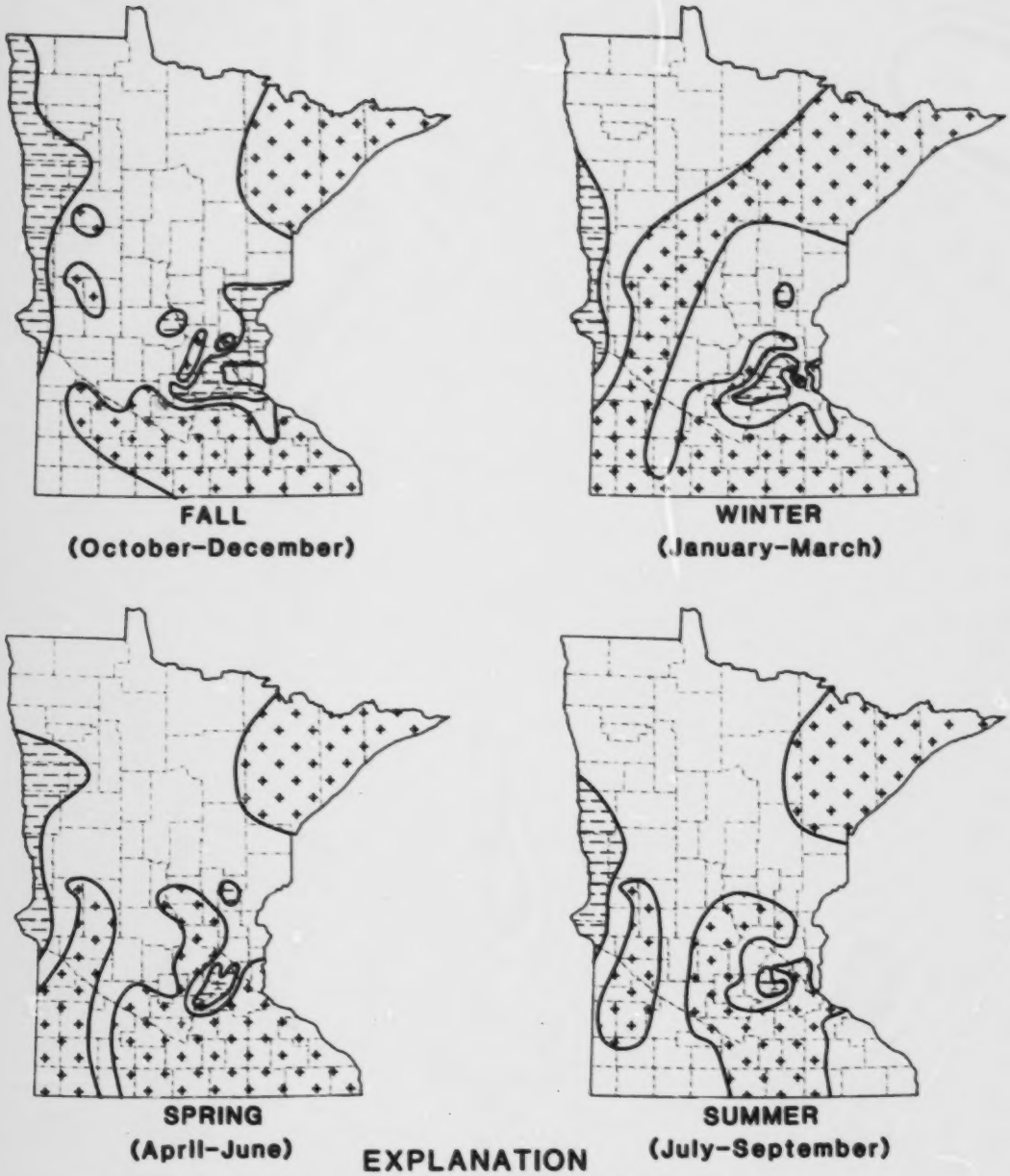


Figure 5.--Relationship of seasonal water levels in confined aquifers to long-term mean levels

BEST COPY AVAILABLE

DEFINITION OF TERMS

Terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined below. See also table for converting inch-pound units to International System of units (SI) on the inside of back cover.

Acre-foot (AC-FT, acre-ft) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or about 326,000 gallons or 1,233 cubic meters.

Adenosine triphosphate (ATP) is the primary energy donor in cellular life process. Its central role in living cells makes it an excellent indicator of the presence of living material in water. A measure of ATP, therefore, provides a sensitive and rapid estimate of biomass. ATP is reported in micrograms per liter of the original water sample.

Algae are mostly aquatic single-celled, colonial, or multi-celled plants, containing chlorophyll and lacking roots, stems, and leaves.

Algal growth potential (AGP) is the maximum algal dry weight biomass that can be produced in a natural water sample under standardized laboratory conditions. The growth potential is the algal biomass present at stationary phase and is expressed as milligrams dry weight of algae produced per liter of sample.

Aquifer is a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian means confined and is used to describe a well in which the water level stands above the top of the aquifer tapped by the well. A flowing artesian well is one in which the water level is above the land surface.

Bacteria are microscopic unicellular organisms, typically spherical, rodlike, or spiral and threadlike in shape, often clumped into colonies. Some bacteria cause disease, others perform an essential role in nature in the recycling of materials; for example, by decomposing organic matter into a form available for reuse by plants.

Total coliform bacteria are a particular group of bacteria that are used as indicators of possible sewage pollution. They are characterized as aerobic or facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria which ferment lactose with gas formation within 48 hours at 35°C. In the laboratory these bacteria are defined as the organisms which produce colonies with a golden-green metallic sheet within 24 hours when incubated at 35°C ± 1.0°C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal coliform bacteria are bacteria that are present in the intestine or feces of warmblooded animals. They are often used as indicators of the sanitary quality of the water. In the laboratory they are defined as all organisms which produce blue colonies within 24 hours when incubated at 44.5°C ± 0.2°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Fecal streptococcal bacteria are bacteria also found in the intestine of warmblooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as gram-positive, cocci bacteria which are capable of growth in brain-heart infusion broth. In the laboratory they are defined as all the organisms which produce red or pink colonies within 48 hours at 35°C ± 1.0°C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

Bed material is the unconsolidated material of which a streambed, lake, pond, reservoir, or estuary bottom is composed.

Biochemical oxygen demand (BOD) is a measure of the quantity of dissolved oxygen, in milligrams per liter, necessary for the decomposition of organic matter by microorganisms, such as bacteria.

Biomass is the amount of living matter present at any given time, expressed as the mass per unit area or volume of habitat.

Ash mass is the mass or amount of residue present after the residue from the dry mass determination has been ashed in a muffle furnace at a temperature of 500°C for 1 hour. The ash mass values of zooplankton and phytoplankton are expressed in grams per cubic meter (g/m^3), and periphyton and benthic organisms in grams per square meter (g/m^2).

Dry mass refers to the weight of residue present after drying in an oven at 60°C for zooplankton and 105°C for periphyton, until the mass remains unchanged. This mass represents the total organic matter, ash and sediment, in the sample. Dry mass values are expressed in the same units as ash mass.

Organic mass or volatile mass of the living substance is the difference between the dry mass and the ash mass, and represents the actual mass of the living matter. The organic mass is expressed in the same units as for ash mass and dry mass.

BEST COPY AVAILABLE

Wet mass is the mass of living matter plus contained water.

Bottom material: See Bed Material.

Cells/volume refers to the number of cells or any organism which is counted by using a microscope and grid or counting cell. Many planktonic organisms are multicelled and are counted according to the number of contained cells per sample, usually milliliters (mL) or liters (L).

Cfs-day is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, approximately 1.9835 acre-feet, or about 646,000 gallons or 2,447 cubic meters.

Chemical oxygen demand (COD) is a measure of the chemically oxidizable material in the water, and furnishes an approximation of the amount of organic and reducing material present. The determined value may correlate with natural water color or with carbonaceous organic pollution from sewage or industrial wastes.

Chlorophyll refers to the green pigments of plants. Chlorophyll a and b are the two most common pigments in plants.

Color unit is produced by one milligram per liter of platinum in the form of the chloroplatinate ion. Color is expressed in units of the platinum-cobalt scale.

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, an artificial structure, or a uniform cross section over a long reach of the channel.

Cubic feet per second per square mile (CFSM) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Cubic foot per second (FT^3/s, ft^3/s) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to approximately 7.48 gallons per second or 448.8 gallons per minute or 0.02832 cubic meters per second.

Discharge is the volume of water (or more broadly, volume of fluid plus suspended sediment), that passes a given point within a given period of time.

Mean discharge (MEAN) is the arithmetic mean of individual daily mean discharges during a specific period.

Instantaneous discharge is the discharge at a particular instant of time.

Dissolved refers to the amount of substance present in true chemical solution. In practice, however, the term includes all forms of substance that will pass through a 0.45-micrometer membrane filter, and thus may include some very small (colloidal) suspended particles. Analyses are performed on filtered samples.

Diversity index is a numerical expression of evenness of distribution of aquatic organisms. The formula for diversity index is:

$$\bar{d} = -\sum_{i=1}^{s} \frac{n_i}{n} \log_2 \frac{n_i}{n}$$

Where n_i is the number of individuals per taxon, n is the total number of individuals, and s is the total number of taxa in the sample of the community. Diversity index values range from zero, when all the organisms in the sample are the same, to some positive number, when some or all of the organisms in the sample are different.

Drainage area of a stream at a specified location is that area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the river above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise noted.

Drainage basin is a part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Gage height (G.H.) is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the more general term "stage," although gage height is more appropriate when used with a reading on a gage.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

BEST COPY AVAILABLE

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is attributable to the presence of alkaline earths (principally calcium and magnesium) and is expressed as equivalent calcium carbonate ($CaCO_3$).

Hydrologic unit is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the Office of Water Data Coordination on the State Hydrologic Unit Maps; each hydrologic unit is identified by an 8-digit number.

Metamorphic stage refers to the stage of development that an organism exhibits during its transformation from an immature form to an adult form. This developmental process exists for most insects, and the degree of difference from the immature stage to the adult form varies from relatively slight to pronounced, with many intermediates. Examples of metamorphic stages of insects are egg-larva-adult or egg-nymph-adult.

Methylene blue active substance (MBAS) is a measure of apparent detergents. This determination depends on the formation of a blue color when methylene blue dye reacts with synthetic detergent compounds.

Micrograms per gram (UG/G, ug/g) is a unit expressing the concentration of a chemical element as the mass (micrograms) of the element sorbed per unit mass (gram) of sediment.

Micrograms per kilogram (MG/KG, mg/kg) is a unit expressing the concentration of a chemical element as the mass (micrograms) of the element sorbed per unit mass (kilogram) of sediment.

Micrograms per liter (UG/L, ug/L) is a unit expressing the concentration of chemical constituents in solution as mass (micrograms) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter.

Milligrams per liter (MG/L, mg/L) is a unit for expressing the concentration of chemical constituents in solution. Milligrams per liter represent the mass of solute per unit volume (liter) of water. Concentration of suspended sediment also is expressed in mg/L, and is based on the mass of sediment per liter of water-sediment mixture.

National Geodetic Vertical Datum of 1929 (NGVD) is a geodetic datum derived from a general adjustment of the first order level nets of both the United States and Canada. It was formerly called "Sea Level Datum of 1929" or "mean sea level" in this series of reports. Although the datum was derived from the average sea level over a period of many years at 26 tide stations along the Atlantic, Gulf of Mexico, and Pacific Coasts, it does not necessarily represent local mean sea level at any particular place.

Organism is any living entity, such as an insect, phytoplankter, or zooplankter.

Organism count/area refers to the number of organisms collected and enumerated in a sample and adjusted to the number per area habitat, usually square meters (m^2), acres, or hectares. Periphyton, benthic organisms, and macrophytes are expressed in these terms.

Organism count/volume refers to the number of organisms collected and enumerated in a sample and adjusted to the number per sample volume, usually milliliters (mL) or liters (L). Numbers of planktonic organisms can be expressed in these terms.

Total organism count is the total number of organisms collected and enumerated in any particular sample.

Parameter code numbers are unique five-digit code numbers assigned to each parameter placed into storage. These codes are assigned by the Environmental Protection Agency and are also used to identify data exchanged among agencies.

Partial-record station is a particular site where limited streamflow and(or) water-quality data are collected systematically over a period of years for use in hydrologic analyses.

Particle size is the diameter, in millimeters (mm), of suspended sediment or bed material determined by either sieve or sedimentation methods. Sedimentation methods (pipet, bottom-withdrawal tube, visual-accumulation tube) determine fall diameter of particles in distilled water (chemically dispersed).

Particle-size classification used in this report agrees with recommendations made by the American Geophysical Union Subcommittee on Sediment Terminology.

The classification is as follows:

Classification	Size (mm)	Method of analysis
Clay	0.00024 - 0.004	Sedimentation.
Silt	.004 - .062	Sedimentation.
Sand	.062 - 2.0	Sedimentation or sieve.
Gravel	2.0 - 64.0	Sieve.

BEST COPY AVAILABLE

The particle-size distributions given in this report are not necessarily representative of all particles in transport in the stream. Most of the organic material is removed and the sample is subjected to mechanical and chemical dispersion before analysis in distilled water.

Percent composition is a unit for expressing the ratio of a particular part of a sample or population to the total sample or population, in terms of types, numbers, mass or volume.

Periphyton is the assemblage of microorganisms attached to and growing upon solid surfaces. While primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms. Periphyton is a useful indicator of water quality.

Pesticides are chemical compounds used to control undesirable plants and animals. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides. Insecticides and herbicides, which control insects and plants respectively, are the two categories reported.

Picocurie (PC, pCi) is one trillionth (1×10^{-12}) of the amount of radioactivity represented by a curie (Ci). A curie is the amount of radioactivity that yields 3.7×10^{10} radioactive disintegrations per second. A picocurie yields 2.22 dpm (disintegrations per minute).

Plankton is the community of suspended, floating, or weakly swimming organisms that live in the open water of lakes and rivers.

Phytoplankton is the plant part of the plankton. They are usually microscopic and their movement is subject to the water currents. Phytoplankton growth is dependent upon solar radiation and nutrient substances. Because they are able to incorporate as well as release materials to the surrounding water, the phytoplankton have a profound effect upon the quality of the water. They are the primary food producers in the aquatic environment, and are commonly known as algae.

Blue-green algae are a group of phytoplankton organisms having a blue pigment, in addition to the green pigment called chlorophyll. Blue-green algae often cause nuisance conditions in water.

Diatoms are the unicellular or colonial algae having a siliceous shell. Their concentrations are expressed as number of cells/mL of sample.

Green algae have chlorophyll pigments similar in color to those of higher green plants. Some forms produce algal mats or floating "moss" in lakes. Their concentrations are expressed as number of cells/mL of sample.

Zooplankton is the animal part of the plankton. Zooplankton are capable of extensive movements within the water column, and are often large enough to be seen with the unaided eye. Zooplankton are secondary consumers feeding upon bacteria, phytoplankton, and detritus. Because they are the grazers in the aquatic environment, the zooplankton are a vital part of the aquatic food web. The zooplankton community is dominated by small crustaceans and rotifers.

Polychlorinated biphenyls (PCBs) are industrial chemicals that are mixtures of chlorinated biphenyl compounds having various percentages of chlorine. They are similar in structure to organochlorine insecticides.

Primary productivity is a measure of the rate at which new organic matter is formed and accumulated through photosynthetic and chemosynthetic activity of producer organisms (chiefly green plants). The rate of primary production is estimated by measuring the amount of oxygen released (oxygen method) or the amount of carbon assimilated by the plants (carbon method).

Milligrams of carbon per area or volume per unit time [mg C/(m^2 · time) for periphyton and macrophytes and mg C/(m^3 · time) for phytoplankton] are units for expressing primary productivity. They define the amount of carbon dioxide consumed as measured by radioactive carbon (carbon 14). The carbon 14 method is of greater sensitivity than the oxygen light and dark bottle method, and is preferred for use in unenriched waters. Unit time may be either the hour or day, depending on the incubation period.

Milligrams of oxygen per area or volume per unit time [mg O_2/(m^2 · time) for periphyton and macrophytes and mg O_2/(m^3 · time) for phytoplankton] are the units for expressing primary productivity. They define production and respiration rates as estimated from changes in the measured dissolved oxygen concentration. The oxygen light and dark bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period.

Recoverable from bottom material is the amount of a given constituent that is in solution after a representative sample of bottom material has been digested by a method (usually using an acid or mixture of acids) that results in dissolution of only readily soluble substances. Complete dissolution of all bottom material is not achieved by the digestion treatment and thus the determination represents less than the total amount (that is, less than 95 percent) of the constituent in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

BEST COPY AVAILABLE

Runoff in inches (IN, in) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Sediment is solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation.

Suspended sediment is the sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

Suspended-sediment concentration is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 ft above the bed) expressed as milligrams of dry sediment per liter of water-sediment mixture (mg/L).

Suspended-sediment discharge (tons/day) is the rate at which dry weight of sediment passes a section of a stream or is the quantity of sediment, as measured by dry weight or volume, that passes a section in a given time. It is computed by multiplying discharge times mg/L times 0.0027.

Suspended-sediment load is quantity of suspended sediment passing a section in a specified period.

Total sediment discharge (tons/day) is the sum of the suspended-sediment discharge and the bed-load discharge. It is the total quantity of sediment, as measured by dry weight or volume, that passes a section during a given time.

Mean concentration is the time-weighted concentration of suspended sediment passing a stream section during a 24-hour day.

Solute is any substance derived from the atmosphere, vegetation, soil, or rocks that is dissolved in water.

Specific conductance is a measure of the ability of a water to conduct an electrical current. It is expressed in micromhos per centimeter at 25°C. Specific conductance is related to the type and concentration of ions in solution and can be used for appoximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in micromhos). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water.

Stage-discharge relation is the relation between gage height (stage) and volume of water per unit of time, flowing in a channel.

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Substrate is the physical surface upon which an organism lived.

Natural substrates refers to any naturally occurring emersed or submersed solid surface, such as a rock or tree, upon which an organism lived.

Artificial substrate is a device which is purposely placed in a stream or lake for colonization of organisms. The artificial substrate simplifies the community structure by standardizing the substrate from which each sample is taken. Examples of artificial substrates are basket samplers (made of wire cages filled with clean streamside rocks) and miltiplate samplers (made of hardboard) for benthic organism collection, and plexiglass strips for periphyton collection.

Surface area of a lake is that area outlined on the latest USGS topographic map as the boundary of the lake and measured by a planimeter in acres. In localities not covered by topographic maps, the areas are computed from the best maps available at the time planimetered. All areas shown are those for the stage when the planimetered map was made.

Surficial bed material is that part (0.1 to 0.2 ft) of the bed material that is sampled using U.S. Series Bed-Material Samplers.

Suspended (as used in tables of chemical analyses) refers to the amount (concentration) of the total concentration in a water-sediment mixture. The water-sediment mixture is associated with (or sorbed on) that material retained on a 0.45 micrometer filter.

BEST COPY AVAILABLE

Suspended, recoverable is the amount of a given constituent that is in solution after the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all the particulate matter is not achieved by the digestion treatment and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

Determinations of "suspended, recoverable" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total recoverable concentrations of the constituent.

Suspended, total is the total amount of a given constituent in the part of a representative water-suspended sediment sample that is retained on a 0.45 um membrane filter. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to determine when the results should be reported as "suspended, total."

Determinations of "suspended, total" constituents are made either by analyzing portions of the material collected on the filter or, more commonly, by difference, based on determinations of (1) dissolved and (2) total concentrations of the constituent.

Taxonomy is the division of biology concerned with the classification and naming of organisms. The classification of organisms is based upon a hierarchical scheme beginning with Kingdom and ending with Species at the base. The higher the classification level, the fewer features the organisms have in common. For example, the taxonomy of a particular mayfly, Hexagenia limbata is the following:

Kingdom.....Animal
Phylum.....Arthropoda
Class.....Insects
Order.....Ephemeroptera
Family.....Ephermeridae
Genus.....Hexageria
Species.....Hexagenia limbata

Time-weighted average is computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had received equal quantities of water from the stream each day for the year.

Tons per acre-foot indicates the dry mass of dissolved solids in 1 acre-foot of water. It is computed by multiplying the concentration in milligrams per liter by 0.00136.

Tons per day is the quantity of substance in solution or suspension that passes a stream section during a 24-hour day.

Total is the total amount of a given constituent in a representative water-suspended sediment sample, regardless of the constituent's physical or chemical form. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and suspended phases of the sample. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total." (Note that the word "total" does double duty here, indicating both that the sample consists of a water-suspended sediment mixture and that the analytical method determines all of the constituent in the sample.)

Total in bottom material is the total amount of a given constituent in a representative sample of bottom material. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as "total in bottom material."

Total load (tons) is the total quantity of any individual constituent, as measured by dry mass or volume, that is dissolved in a specific amount of water (discharge) during a given time. It is computed by multiplying the total discharge, times the mg/L of the constituent, times the factor 0.0027, times the number of days.

Total recoverable refers to the amount of a given constituent that is in solution after a representative water-suspended sediment sample has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all particulate matter is not achieved by the digestion treatment, and thus the determination represents something less than the "total" amount (that is, less than 95 percent) of the constituent present in the dissolved and suspended phases of the sample. To achieve comparability of analytical data, equivalent digestion procedures would be required of all laboratories performing such analyses because different digestion procedures are likely to produce different analytical results.

BEST COPY AVAILABLE

Weighted average is used in this report to indicate discharge-weighted average. It is computed by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharge. A discharge-weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

WDR is used as an abbreviation for "Water-Data Report" in reference to published reports beginning in 1975.

WRD is used as an abbreviation for "Water-Resources Data" in the REVISED RECORDS paragraph to refer to State annual basic-data reports published before 1975.

WSP is used as an abbreviation for "Water-Supply Paper" in references to previously published reports.

DOWNSTREAM ORDER AND STATION NUMBER

Since October 1, 1950, the order of listing hydrologic-station records in Survey reports is in a downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary that enters between two main-stream stations is listed between them. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is situated with respect to the stream to which it is immediately tributary is indicated by an indention in a list of stations in the front of the report. Each indention represents one rank. This downstream order and system of indention show which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

As an added means of identification, each hydrologic station and partial-record station has been assigned a station number. These are in the same downstream order used in this report. In assigning station numbers, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list made up of both types of stations. Gaps are left in the series of numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete 8-digit number for each station such as 05041000, which appears just to the left of the station name, includes the 2-digit part number "05" plus the 6-digit downstream order number "041000."

NUMBERING SYSTEM FOR WELLS AND MISCELLANEOUS SITES

The 8-digit downstream order station numbers are not assigned to wells and miscellaneous sites where only random water-quality samples or discharge measurements are taken.

The well and miscellaneous site numbering system of the U.S. Geological Survey is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, the next 7 digits denote degrees, minutes, and seconds of longitude, and the last 2 digits (assigned sequentially) identify the wells or other sites within a 1-second grid. See figure 6 below. Each well site is also identified by a local well number which consists of township, range, and section numbers, three letters designating 1/4, 1/4, 1/4 section location, and a two digit sequential number.

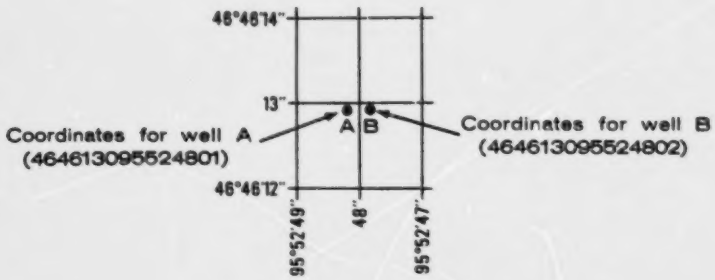


Figure 6.--Example of system for numbering well and miscellaneous sites

BEST COPY AVAILABLE

SPECIAL NETWORKS AND PROGRAMS

Hydrologic bench-mark station is one that provides hydrologic data for a basin in which the hydrologic regimen will likely be governed solely by natural conditions. Data collected at a bench-mark station may be used to separate effects of natural from manmade changes in other basins which have been developed and in which the physiography, climate, and geology are similar to those in the undeveloped bench-mark basin.

National stream-quality accounting network (NASQAN) is a data collection network designed by the U.S. Geological Survey to meet many of the information demands of agencies or groups involved in national or regional water-quality planning and management. Both accounting and broad-scale monitoring objectives have been incorporated into the network design. Areal configuration of the network is based on river-basin accounting units (identified by 8-digit hydrologic-unit numbers) designated by the Office of Water Data Coordination in consultation with the Water Resources Council. Primary objectives of the network are (1) to depict areal variability of streamflow and water-quality conditions nationwide on a year-by-year basis and (2) to detect and assess long-term changes in streamflow and stream quality.

Pesticide program is a network of regularly sampled water-quality stations where samples are collected to determine the concentration and distribution of pesticides in streams where potential contamination could result from the application of the commonly used insecticides and herbicides. Operation of the network is a Federal interagency activity.

Radiochemical program is a network of regularly sampled water-quality stations where samples are collected to be analyzed for radiosotopes. The streams that are sampled represent major drainage basins in the conterminous United States.

Tritium network is a network of stations which has been established to provide base line information on the occurrence of tritium in the Nation's surface waters. In addition to the surface-water stations in the network, tritium data are also obtained at a number of precipitation stations. The purpose of the precipitation stations is to provide an estimate sufficient for hydrologic studies of the tritium input to the United States.

EXPLANATION OF STAGE AND WATER-DISCHARGE RECORDS

COLLECTION AND COMPUTATION OF DATA

The base data collected at gaging stations consist of records of stage and measurements of discharge of streams or canals, and stage, surface area, and contents of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. Records of stage are obtained from either direct readings on a nonrecording gage or from a water-stage recorder that gives either a continuous graph of the fluctuations or a tape punched at selected time intervals. Measurements of discharge are made with a current meter, using the general methods adopted by the Geological Survey. These methods are described in standard text-books, in Water-Supply Paper 888, and in U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chapter A6.

For stream-gaging stations, rating tables giving the discharge for any stage are prepared from stage-discharge relation curves. If extensions to the rating curves are necessary to express discharge greater than measured, they are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, computation of flow over dams or weirs), step-backwater techniques, velocity-area studies, and logarithmic plotting. The daily mean discharge is computed from gage heights and rating tables, then the monthly and yearly mean discharges are computed from the daily figures. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is computed by the shifting-control method, in which correction factors based on individual discharge measurements and notes by hydrologists and observers are used in applying the gage heights to the rating tables. If the stage-discharge relation for a station is temporarily changed by the presence of aquatic growth or debris on the control, the daily mean discharge is computed by what is basically the shifting-control method.

At some stream-gaging stations the stage-discharge relation is affected by the backwater from reservoirs, tributary streams, or other sources. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in computing discharge. The slope or fall is obtained by means of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relation is affected by changing stage; at these stations the rate of change in stage is used as a factor in computing discharge.

At some northern stream-gaging stations the stage-discharge relation is affected by ice in the winter, and it becomes impossible to compute the discharge in the usual manner. Discharge for periods of ice effect is computed on the basis of gage-height record and occasional winter discharge measurements. Consideration is given to the available information on temperature and precipitation, notes by gage observers and hydrologists, and comparable records of discharge for other stations in the same or nearby basins.

For a lake or reservoir station, capacity tables giving the contents for any stage are prepared from stage-area relation curves defined by surveys. The application of the stage to the capacity table gives the contents, from which the daily, monthly, or yearly change in contents is computed.

BEST COPY AVAILABLE

If the stage-capacity curve is subject to changes because of deposition of sediment in the reservoir, periodic resurveys of the reservoir are necessary to define new stage-capacity curves. During the period between reservoir surveys the computed contents may be increasingly in error due to the gradual accumulation of sediment.

For some gaging stations there are periods when no gage-height record is obtained or the recorded gage height is so faulty that it cannot be used to compute daily discharge or contents. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods the daily discharges are estimated on the basis of recorded range-in-stage, prior and subsequent records, discharge measurements, weather records, and comparison with records for other stations in the same or nearby basins. Likewise daily contents may be estimated on the basis of operator's log, prior and subsequent records, inflow-outflow studies, and other information.

The data in this report generally comprise a description of the station and tabulations of daily and monthly figures. For gaging stations on streams or canals a table showing the daily discharge and monthly and yearly discharge is given. For gaging stations on lakes and reservoirs a monthly summary table of stage and contents or a table showing the daily contents is given. Tables of daily mean gage heights are included for some streamflow stations and for some reservoir stations. Records are published for the water year, which begins on October 1 and ends on September 30.

The description of the gaging station gives the location, drainage area, period of record, notations of revisions of previously published records, type and history of gages, general remarks, average discharge, and extremes of discharge or contents. The location of the gaging station and the drainage area are obtained from most accurate maps available. River mileage, given under "LOCATION" for some stations, is that determined and used by the Corps of Engineers or other agencies. Periods for which there are published records for the present station or for stations generally equivalent to the present one are given under "PERIOD OF RECORD."

Previously published streamflow records of some stations have been found to be in error on the basis of data or information later obtained. Revisions of such records are usually published along with the current records in one of the annual or compilation reports. In order to make it easier to find such revised records, a paragraph headed "REVISED RECORDS" has been added to the description of all stations for which revised records have been published. Listed herein are all the reports in which revisions have been published, each followed by the water years for which figures are revised in that report. In listing the water years only one number is given; for instance, 1965 stands for the water year October 1, 1964, to September 30, 1965. If no daily, monthly, or annual figures of discharge are affected by the revision, the fact is brought out by notations after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the revised figure was first published is given. It should be noted that for all stations for which cubic feet per second per square mile and runoff in inches are published, a revision of the drainage area necessitates corresponding revision of all figures based on the drainage area. Revised figures of cubic feet per second per square mile and runoff in inches resulting from a revision of the drainage area only are usually not published in the annual series of reports.

The type of gage currently in use; the datum of the present gage referred to National Geodetic Vertical Datum; and a condensed history of the types, locations, and datums of previous gages used during the period of record are given under "GAGE." National Geodetic Vertical Datum is explained in "DEFINITION OF TERMS."

Information pertaining to the accuracy of the discharge records and to conditions which affect the natural flow of the gaging station is given under "REMARKS." For reservoir stations, information on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir is given under "REMARKS."

The average discharge for the number of years indicated is given under "AVERAGE DISCHARGE"; it is not given for stations having fewer than 5 complete years of record or for stations where changes in water development during the period of record cause the figure to have little significance. In addition, the median of yearly mean discharges is given for stream-gaging stations having 10 or more complete years of record if the median differs from the average by more than 10 percent. Under "EXTREMES" are given first, the extremes for the period of record, second, information available outside the period of record, and last, those for the current year. Unless otherwise qualified, the maximum discharge (or contents) is the instantaneous maximum corresponding to the crest stage obtained by use of a water-stage recorder (graphic or digital), a crest-stage gage, or a nonrecording gage read at the time of crest. If the maximum gage height did not occur on the same day as the maximum discharge (or contents), it is given separately. Similarly, the minimum is the instantaneous minimum unless otherwise qualified. For some stations, peak discharges are listed with "EXTREMES FOR CURRENT YEAR." If they are, all independent peaks above the selected base are published in tabular format with the time of occurrence and corresponding gage heights, including the maximum for the year. The base discharge, which is given in the table heading, is selected so that an average of about three peaks a year will be presented. Peak discharges are not published for any canals, ditches, drains, or for any stream for which the peaks are subject to substantial control by man. Time of day is expressed in 24-hour local standard time; for example, 12:30 a.m. is 0030, 1:30 p.m. is 1330. The minimums for these stations are published in a separate paragraph following the table of peaks.

BEST COPY AVAILABLE

The daily table for stream-gaging stations gives the mean discharge for each day and is followed by monthly and yearly summaries. In the monthly summary below the daily table, the line headed "TOTAL" gives the sum of the daily figures. The line headed "MEAN" gives the average flow in cubic feet per second during the month. The lines headed "MAX" and "MIN" give the maximum and minimum daily discharges, respectively, for the month. Discharge for the month also may be expressed in cubic feet per second per square mile (line headed "CFSM"), or in inches (line headed "IN"), or in acre-feet (line headed "AC-FT"). Figures for cubic feet per second per square mile and runoff in inches are omitted if there is extensive regulation or diversion, if the drainage area includes large noncontributing areas, or if the average annual rainfall over the drainage basin is usually less than 20 inches. In the yearly summary below the monthly summary, the figures shown are the appropriate daily discharges for the calendar and water years.

Footnotes to the table of daily discharge are introduced by the word "NOTE." Footnotes are used to indicate periods for which the discharge is computed or estimated by special methods because of no gage-height record, backwater from various sources, or other unusual conditions. Periods of no gage-height record are indicated if the period is continuous for a month or more or includes the maximum discharge for the year. Periods of backwater from an unusual source, of indefinte stage-discharge relation, or of any other unusual condition at the gage site are indicated only if they are a month or more in length and the accuracy of the records is affected. Days on which the stage-discharge relation is affected by ice are not indicated. The methods used in computing discharge for various unusual conditions have been explained in preceding paragraphs.

For mos. gaging stations on lakes and reservoirs the data presented comprise a description of the station and a monthly summary table of stage and contents. For some reservoirs a table showing daily contents or stage is given.

Data collected at partial-record stations follow the information for continuous record sites. Data for partial-record discharge stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. The tables of partial-record stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. Occasionally, a series of discharge measurements are made within a short time period to investigate the seepage gains or losses along a reach of a stream or to determine the low-flow characteristics of an area. Such measurements are also given in special tables following the tables of partial-record stations.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS

The accuracy of streamflow data depends primarily on (1) the stability of the stage-discharge relation or, if the control is unstable, the frequency of discharge measurements, and (2) the accuracy of observations of stage, measurements of discharge, and interpretations of records.

The station description under "REMARKS" states the degree of accuracy of the records. "Excellent" means that about 95 percent of the daily discharges are within 5 percent; "good," within 10 percent; and "fair," within 15 percent. "Poor" means that daily discharges have less than "fair" accuracy.

Figures of daily mean discharge in this report are shown to the nearest hundredth of a cubic foot per second for discharges of less than 1 ft^3/s; to tenths between 1.0 and 10 ft^3/s; to whole numbers between 10 and 1,000 ft^3/s; and to 3 significant figures above 1,000 ft^3/s. The number of significant figures used is based solely on the magnitude of the figure. The same rounding rules apply to discharge figures listed for partial-record stations.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumption, regulation by storage, increase or decrease in evaporation due to artificial causes, or to other factors. For such stations, figures of cubic feet per second per square mile and of runoff in inches are not published unless satisfactory adjustments can be made for diversions, for changes in contents of reservoirs, or for other changes incident to use and control. Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or losses are large in comparison with the observed discharge.

OTHER DATA AVAILABLE

Information of a more detailed nature than that published for most of the gaging stations such as observations of water temperatures, discharge measurements, gage-height records, and rating tables is on file in the district office. Also most gaging-station records are available in computer-usable form and many statistical analyses have been made.

Information on the availability of unpublished data or statistical analyses may be obtained from the district office.

RECORDS OF DISCHARGE COLLECTED BY AGENCIES OTHER THAN THE GEOLOGICAL SURVEY

The National Water Data Exchange, Water Resources Division, U.S. Geological Survey, National Center, Reston, VA 22092, maintains an index of all discharge measurement sites in the State. Information on records available at specific sites can be obtained upon request.

BEST COPY AVAILABLE

EXPLANATION OF WATER-QUALITY RECORDS

COLLECTION AND EXAMINATION OF DATA

Surface-water samples for analyses usually are collected at or near gaging stations. The quality-of-water records are given immediately following the discharge records at these stations.

The descriptive heading for water-quality records gives the period of record for all water-quality data; the period of daily record for parameters that are measured on a daily basis (specific conductance, pH, dissolved oxygen, water temperature, sediment discharge, etc.); extremes for the period of daily record; extremes for the current year; and general remarks.

For ground-water records, no descriptive statements are given; however, the well number, depth of well, date of sampling and (or) other pertinent data are given in the table containing the chemical analyses of the ground water.

If errors in published water-quality records are discovered after publication, appropriate updates are made to the Water-Quality File in the U.S. Geological Survey's computerized data system, WATSTORE, and subsequently by monthly transfer of update transactions to the U.S. Environmental Protection Agency's STORET system. Because the usual volume of updates makes it impractical to document individual changes in the State data-report series or elsewhere, potential users of U.S. Geological Survey water-quality data are encouraged to obtain all required data from the appropriate computer file to insure the most recent updates.

WATER ANALYSIS

Most methods for collecting and analyzing water samples are described in the U.S. Geological Survey Techniques of Water-Resources Investigations listed on a following page.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled through several vertical sections to obtain a representative sample needed for an accurate mean concentration and for use in calculating load.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum, minimum, and mean values for each constituent measured and are based upon hourly punches beginning at 0100 hours and ending at 2400 hours for the day of record. More detailed records (hourly values) may be obtained from the district office.

WATER TEMPERATURE

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same time each day. Large streams have a small daily temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published.

SEDIMENT

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross sections.

During periods of rapidly changing flow or rapidly changing concentration, samples may have been collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration were computed by the subdivided-day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method. For periods when no samples were collected, daily loads of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

BEST COPY AVAILABLE

At other stations, suspended-sediment samples were collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observations, such data are useful in establishing seasonal relations between quality and streamflow in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of the quantities of suspended sediment, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included.

EXPLANATION OF GROUND-WATER LEVEL RECORDS

COLLECTION OF THE DATA

Only ground-water-level data from a basic network of observation wells are published herein. This basic network contains observation wells so located that the most significant data are obtained from the fewest wells in the most important aquifers.

Each well is identified by means of (1) a 15-digit number that is based on latitude and longitude and (2) a local number that is provided for local needs. See figure 6.

Measurements are made in many types of wells, under varying conditions of access and at different temperatures, hence, neither the method of measurement nor the equipment can be standardized. At each observation well, however, the equipment and techniques used are those that will ensure that measurements at each well are consistent.

Water-level measurements in this report are given in feet with reference to either NGVD of 1929 or land-surface datum (lsd). NGVD of 1929 is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum in NGVD of 1929 is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (eom).

Water levels are reported to as many significant figures as can be justified by the local conditions. For example, in a measurement of a depth to water of several hundred feet, the error in determining the absolute value of the total depth to water may be a few tenths of a foot, whereas the error in determining the net change of water level between successive measurements may be only a hundredth or a few hundredths of a foot. For lesser depths to water the accuracy is greater. Accordingly, most measurements are reported to a hundredth of a foot, but some are given only to a tenth of a foot or a larger unit.

Hydrographs showing water-level fluctuations are included for 20 representative wells; 1 bedrock, 6 buried-sand, and 13 surficial sand wells.

ACCESS TO WATSTORE DATA

The National WATer Data STOrage and REtrieval System (WATSTORE) was established for handling water data collected through the activities of the U.S. Geological Survey and to provide for more effective and efficient means of releasing the data to the public. The system is operated and maintained on the central computer facilities of the Survey at its National Center in Reston, Virginia.

WATSTORE can provide a variety of useful products ranging from simple data tables to complex statistical analyses. A minimal fee, plus the actual computer cost incurred in producing a desired product, is charged to the requester. Information about the availability of specific types of data, the acquisition of data or products, and user charges can be obtained locally from each of the Water Resources Division's district offices (see address given on back of the title page).

General inquiries about WATSTORE may be directed to:

Chief Hydrologist
U.S. Geological Survey
437 National Center
Reston, Virginia 22092

BEST COPY AVAILABLE

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

Thirty-seven manuals by the U.S. Geological Survey have been published to date in the series on techniques describing procedures for planning and executing specialized work in water-resources investigations. The material is grouped under major subject headings called books and is further divided into sections and chapters. For example, Section A of Book 3 (Applications of Hydraulics) is on surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises. The reports listed below are for sale by the U.S. Geological Survey, Branch of Distribution, 604 South Pickett St., Alexandria, VA 22304 (authorized agent of the Superintendent of Documents, Government Printing Office).

NOTE: When ordering any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations".

1-D1. *Water temperature--influential factors, field measurement, and data presentation*, by H. H. Stevens, Jr., J. F. Ficke, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages.

1-D2. *Guidelines for collection and field analysis of ground-water samples for selected unstable constituents*, by W. W. Wood: USGS--TWRI Book 1, Chapter D2. 1976. 24 pages.

2-D1. *Application of surface geophysics to ground-water investigations*, by A. A. R. Zohdy, G. P. Eaton, and D. R. Mabey: USGS--TWRI Book 2, Chapter D1. 1974. 116 pages.

2-E1. *Application of borehole geophysics to water-resources investigations*, by W. S. Keys and L. M. MacCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages.

3-A1. *General field and office procedures for indirect discharge measurements*, by M. A. Benson and Tate Dalrymple: USGS--TWRI Book 3, Chapter A1. 1967. 30 pages.

3-A2. *Measurement of peak discharge by the slope-area method*, by Tate Dalrymple and M. A. Benson: USGS--TWRI Book 3, Chapter A2. 1967. 12 pages.

3-A3. *Measurement of peak discharge at culverts by indirect methods*, by G. L. Bodhaine: USGS--TWRI Book 3, Chapter A3. 1968. 60 pages.

3-A4. *Measurement of peak discharge at width contractions by indirect methods*, by H. F. Matthai: USGS--TWRI Book 3, Chapter A4. 1967. 44 pages.

3-A5. *Measurement of peak discharge at dams by indirect methods*, by Harry Hulsing: USGS--TWRI Book 3, Chapter A5. 1967. 29 pages.

3-A6. *General procedure for gaging streams*, by R. W. Carter and Jacob Davidian: USGS--TWRI Book 3, Chapter A6. 1968. 13 pages.

3-A7. *Stage measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A7. 1968. 28 pages.

3-A8. *Discharge measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A8. 1969. 65 pages.

3-A9. *Measurement of time of travel and dispersion in streams by dye tracing*, by E. F. Hubbard, F. A. Kilpatrick, L. A. Martens, and J. F. Wilson, Jr.: USGS--TWRI Book 3, Chapter A9. 1982. 44 pages.

3-A11. *Measurement of discharge by moving-boat method*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages.

3-B1. *Aquifer-test design, observation, and data analysis*, by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages.

3-B2. *Introduction to ground-water hydraulics, a programed text for self-instruction*, by G. D. Bennett: USGS--TWRI Book 3, Chapter B2. 1976. 172 pages.

3-B3. *Type curves for selected problems of flow to wells in confined aquifers*, by J. E. Reed: USGS--TWRI Book 3, Chapter B3. 1980. 106 pages.

3-C1. *Fluvial sediment concepts*, by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages.

3-C2. *Field methods for measurement of fluvial sediment*, by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages.

3-C3. *Computation of fluvial-sediment discharge*, by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages.

4-A1. *Some statistical tools in hydrology*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A1. 1968. 39 pages.

4-A2. *Frequency curves*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A2. 1968. 15 pages.

4-B1. *Low-flow investigations*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B1. 1972. 18 pages.

4-B2. *Storage analyses for water supply*, by H. C. Riggs and C. H. Hardison: USGS--TWRI Book 4, Chapter B2. 1973. 20 pages.

4-B3. *Regional analyses of streamflow characteristics*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B3. 1973. 15 pages.

4-D1. *Computation of rate and volume of stream depletion by wells*, by C. T. Jenkins: USGS--TWRI Book 4, Chapter D1. 1970. 17 pages.

5-A1. *Methods for determination of inorganic substances in water and fluvial sediments*, by M. W. Skougstad and others, editors: USGS--TWRI Book 5, Chapter A1. 1979. 626 pages.

5-A2. *Determination of minor elements in water by emission spectroscopy*, by P. R. Barnett and E. C. Mallory, Jr.: USGS--TWRI Book 5, Chapter A2. 1971. 31 pages.

5-A3. *Methods for analysis of organic substances in water*, by D. F. Goerlitz and Eugene Brown: USGS--TWRI Book 5, Chapter A3. 1972. 40 pages.

5-A4. *Methods for collection and analysis of aquatic biological and microbiological samples*, edited by P. E. Greeson, T. A. Ehlke, G. A. Irwin, B. W. Lium, and K. V. Slack: USGS--TWRI Book 5, Chapter A4. 1977. 332 pages.

5-A5. *Methods for determination of radioactive substances in water and fluvial sediments*, by L. L. Thatcher, V. J. Janzer, and K. W. Edwards: USGS--TWRI Book 5, Chapter A5. 1977. 95 pages.

5-C1. *Laboratory theory and methods for sediment analysis*, by H. P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages.

7-C1. *Finite difference model for aquifer simulation in two dimensions with results of numerical experiments*, by P. C. Trescott, G. F. Pinder, and S. P. Larson: USGS--TWRI Book 7, Chapter C1. 1976. 116 pages.

7-C2. *Computer model of two-dimensional solute transport and dispersion in ground water*, by L. F. Konikow and J. D. Bredehoeft: USGS--TWRI Book 7, Chapter C2. 1978. 90 pages.

7-C3. *A model for simulation of flow in singular and interconnected channels*, by R. W. Schaffranek, R. A. Baltzer, and D. E. Goldberg: USGS--TWRI Book 7, Chapter C3. 1981. 110 pages.

8-A1. *Methods of measuring water levels in deep wells*, by M. S. Garber and F. C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages

8-B2. *Calibration and maintenance of vertical-axis type current meters*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 8, Chapter B2. 1968. 15 pages.

BEST COPY AVAILABLE

DISCONTINUED GAGING STATIONS

The following continuous-record streamflow or stage stations in Minnesota have been discontinued or converted to partial-record stations. Daily streamflow or stage records were collected and published for the period of record shown for each station.

Station number	Station name	Drainage area (mi^2)	Period of record
	Streams tributary to Lake Superior		
04010000	Pigeon River above mouth of Arrow River, MN	256	1924-27
04011000	Brule River at mouth near Hoveland, MN	248	1911†
04011500	Devil Track River at mouth near Grand Marais, MN	a77	1911†
04012000	Cascade River at mouth near Grand Marais, MN	111	1911†
*04012500	Poplar River at Lutsen, MN	114	1911†, 1912-17, 1928-47, 1952-61
04013000	Cross River at Schroeder, MN	a91	1931-32
04015000	Beaver Creek (Beaver Bay Run) at Beaver Bay, MN	126	1911-14, 1928-31
04015455	South Branch Partridge River near Babbitt, MN	18.5	1977-80
04015500	Second Creek near Aurora, MN	29	1955-80
04016000	Partridge River near Aurora, MN	161	1942-82
04017000	Embarrass River at Embarrass, MN	93.8	1942-64
04018000	Embarrass River near McKinley, MN	171	1953-62
04018900	East Two Rivers near Iron Junction, MN	40.0	1966-79
04019000	West Two Rivers near Iron Junction, MN	65.3	1953-62, 1965-79
04019300	West Swan River near Silica, MN	16.3	1963-79
04019500	East Swan River near Toivola, MN	112	1953-62, 1964-71
04020000	Swan River near Toivola, MN	254	1952-61
04021000	Whiteface River below (at) Meadowlands, MN	453	1909-17
04023000	Cloquet River at Independence, MN	a750	1909-17
04023500	St. Louis River near Cloquet, MN	a3,400	1903†
04024090	Elim Creek near Holyoke, MN	1.06	1976-78
04024093	Skunk Creek below Elim Creek near Holyoke, MN	8.83	1976-78
	Red River of the North basin		
05030000	Otter Tail River near Detroit Lakes, MN	270	1937-71
05030500	Otter Tail River at German Church, near Fergus Falls, MN	a1,230	1904-17
05033900	Pelican River at Detroit Lakes, MN	-	1968-71, 1974-75
05034100	Pelican River at Detroit Lake outlet near Detroit Lakes, MN	-	1968-71, 1972-75
05035100	Long Lake outlet near Detroit Lakes, MN	-	1968-71
05035200	West Branch County Ditch No. 14 near Detroit Lakes, MN	-	1968-71
05035300	East Branch County Ditch No. 14 near Detroit Lakes, MN	-	1968-71
05035500	St. Clair Lake outlet near Detroit Lakes, MN	-	1968-75
05035600	Pelican River at Muskrat Lake outlet near Detroit Lakes, MN	-	1968-75
05037100	Pelican River at Sallie Lake outlet near Detroit Lakes, MN	-	1968-75
05039100	Pelican River at Lake Melissa outlet near Detroit Lakes, MN	-	1968-75
05040000	Pelican River near Detroit Lakes, MN	123	1942-53
05040500	Pelican River near Fergus Falls, MN	482	1909-12, 1942-80

"See footnotes at end of table."

BEST COPY AVAILABLE

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Red River of the North basin--Continued		
05045500	Otter Tail River (Red River) near Fergus Falls, MN	a1,690	1909-10†
05046500	Otter Tail River near Breckenridge, MN	a2,040	1931-32, 1939-46†
05047000	Mustinka River (head of Bois de Sioux River) near Norcross, MN	-	1940-47
05047500	Mustinka ditch above West Branch Mustinka River (Twelve Mile Creek) near Charlesville, MN	-	1943-55
05048000	Mustinka ditch below West Branch Mustinka River (Twelve Mile Creek) near Charlesville, MN	-	1943-55
05048500	West Branch Mustinka River (Twelve Mile Creek) below Mustinka ditch near Charlesville, MN	-	1943-55
05049000	Mustinka River above (near) Wheaton, MN	834	1915-24, 1930-58
05050500	Bois de Sioux River below Fairmont, ND	a1,540	1919-44
05051000	Rabbit River at Cambell, MN	266	1942-52
05054020	Red River of the North below Fargo, ND	-	1969-78
*05061200	Whiskey Creek at Barnesville, MN	25.3	1964-66
05063000	Wild Rice River near Ada, MN	a1,100	1948-54
*05063500	South Branch Wild Rice River near Borup, MN	254	1944-49
05067000	Marsh River below Ada, MN	-	1948-52
05068000	Sand Hill River at Beltrami, MN	a324	1943-58
05068500	Sand Hill ditch at Beltrami, MN	-	1943-58
05075500	Thief River near Gatske, MN	-	1953-56
05076500	Red Lake River at Thief River Falls, MN	a3,450	1909-18, 1920-30
05077000	Clearwater River near Pinewood, MN	132	1940-45
05077500	Clearwater River near Leonard, MN	153	1934-47
*05077700	Ruffy Brook near Gonvick, MN	45.2	1960-78
05083500	Red River of the North at Oslo, MN	331,200	1936-37, 1941-43, 1945-60, 1973-78
05085500	Snake River at Warren, MN	a175	1945, 1953-56
05086000	Snake River at Alvarado, MN	309	1945, 1953-56
05086500	Snake River near Argyle, MN	481	1945
05087000	Middle River near Strandquist, MN	-	1953-56
05090500	Tamarac River near Strandquist, MN	-	1953-56
05091000	Tamarac River at Stephen, MN	-	1945
05091500	Tamarac River near Stephen, MN	a320	1945, 1953-55
05092500	Two Rivers (Middle Fork Two Rivers) near Hallock, MN	131	1931-38
05093000	South Branch (South Fork) Two Rivers near Pelan, MN	281	1928-38, 1953-56
*05094000	South Branch Two Rivers at Lake Bronson, MN	444	1928-36, 1937, 1941-43, 1944, 1945-47, 1953-81
05094500	South Branch Two Rivers (Two Rivers) at Hallock, MN	-	1940-47

"See footnotes at end of table."

BEST COPY AVAILABLE

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Red River of the North basin--Continued		
05095000	Two Rivers (South Branch Two Rivers) at Hallock, MN	625	1911-14, 1929-30, 1938-39, 1941-43
05095500	Two Rivers below Hallock, MN	644	1945-55
05096000	North Branch (North Fork) Two Rivers near Lancaster, MN	a32	1929-38, 1941-55
05096500	State Ditch 85 near Lancaster, MN	a95	1929-38, 1942-55
05097000	North Branch Two Rivers at Lancaster, MN	209	1941-42, 1953-56
05097500	North Branch Two Rivers near Northcote, MN	386	1941-42, 1945-51
05098000	Two Rivers below North Branch near Hallock, MN	a1,060	1941-43
05103000	Roseau River (at) near Malung, MN	252	1928-46
05104000	South Fork (West Branch) Roseau River near Malung, MN	312	1911-14, 1928-46
05105000	Roseau River at Roseau, MN	-	1940-47
05105500	Roseau River near Roseau, MN	-	1930-60
05106000	Sprague Creek near Sprague, Manitoba	176	1928-81
05107000	Pine Creek near Pine Creek, MN	74.6	1928-53
05108000	Roseau River near Badger, MN	-	1928-69
05108500	Roseau River near Duxby, MN	-	1929-51, 1952-56
05109000	Badger Creek near Badger, MN	a2.2	1929-30, 1931-38
05109500	Roseau River near Haug, MN	-	1932-66
05110000	Roseau River at outlet of State Ditch 69 near Oak Point, MN	-	1939-42
05110500	Roseau River at head of State Ditch 51 near Oak Point, MN	-	1933-42
05111000	Roseau River at Oak Point, MN	-	1933-39, 1941-60
05112500	Roseau River at International boundary, near Caribou, MN	a1,590	1933-69
	Lake of the Woods basin		
05124500	Isabella River near Isabella, MN	341	1953-61, 1976-77
05125000	South Kawishiwi River near Ely, MN	-	1953-61, 1976-78
05125500	Stony River near Isabella, MN	180	1953-64
05125550	Stony River near Babbitt, MN	219	1975-80
05126000	Dunka River near Babbitt, MN	53.4	1951-62, 1975-80
05126210	South Kawishiwi River above White Iron Lake near Ely, MN		1975-78
05126500	Bear Island River near Ely, MN	68.5	1953-62, 1975-77
05127205	Burntside River near Ely, MN	-	1967-78
05127207	Bjorkman's Creek near Ely, MN	1.36	1972-78
05127210	Armstrong Creek near Ely, MN	5.29	1967-78
05127215	Longstorff Creek near Ely, MN	8.84	1967-78
05127219	Shagawa Lake tributary at Ely, MN	1.84	1971-78
05127220	Burgo Creek near Ely, MN	3.04	1967-78

"See footnotes at end of table."

BEST COPY AVAILABLE

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Lake of the Woods basin--Continued		
05127230	Shagawa River near Ely, MN	99	1967-78
05128340	Pike River near Biwabik, MN	-	1977-79
05128500	Pike River near Embarrass, MN	115	1953-64, 1976-79
05129000	Vermilion River below Vermilion Lake near Tower, MN	483	1911-17, 1928-81
05129500	Rainy River at International Falls, MN	14,900	1905-60
05130000	Sturgeon River (Lake) at Side Lake, MN	-	1938-47
05131000	Dark River near Chisholm, MN	50.6	1942-61, 1965-79
05131800	Deer Lake outlet (Deer Lake) near Effie, MN	-	1937-39, 1940-45
05132500	Big Fork River at Laurel, MN	-	1909
05133000	Black River near Loman, MN	-	1909
05139500	Warroad River near Warroad, MN	162	1946-80
*05140000	Bulldog Run near Warroad, MN	14.2	1946-51, 1966-77
*05140500	East Branch Warroad River near Warroad, MN	102	1946-54, 1966-77

* Presently operated as high-flow partial-record station.
† Stage records only.
a Approximately.

BEST COPY AVAILABLE

BEST COPY AVAILABLE

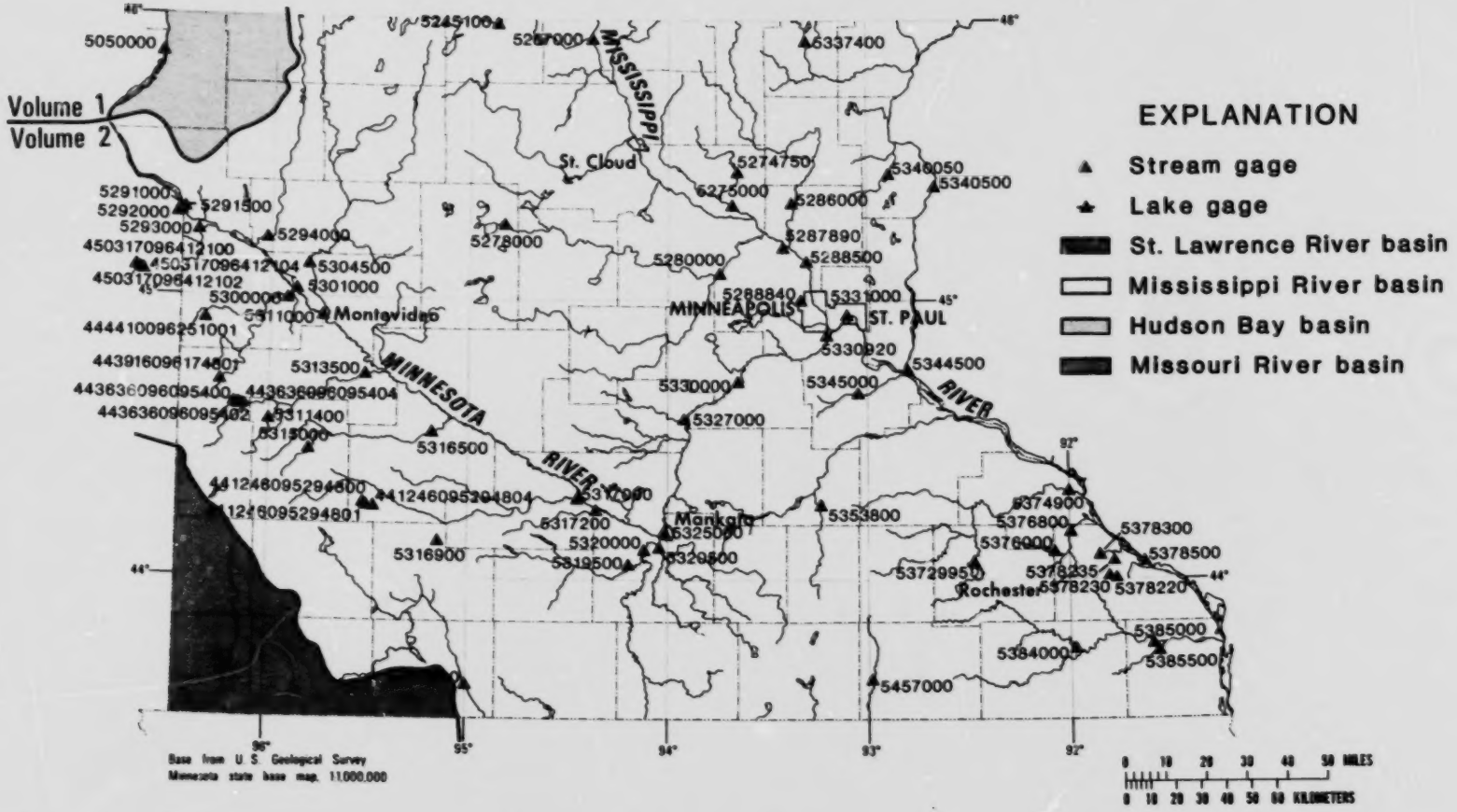


Figure 7.--Location of water-discharge stations

BEST COPY AVAILABLE

BEST COPY AVAILABLE

BLANK PAGE

BLANK PAGE

BLANK PAGE

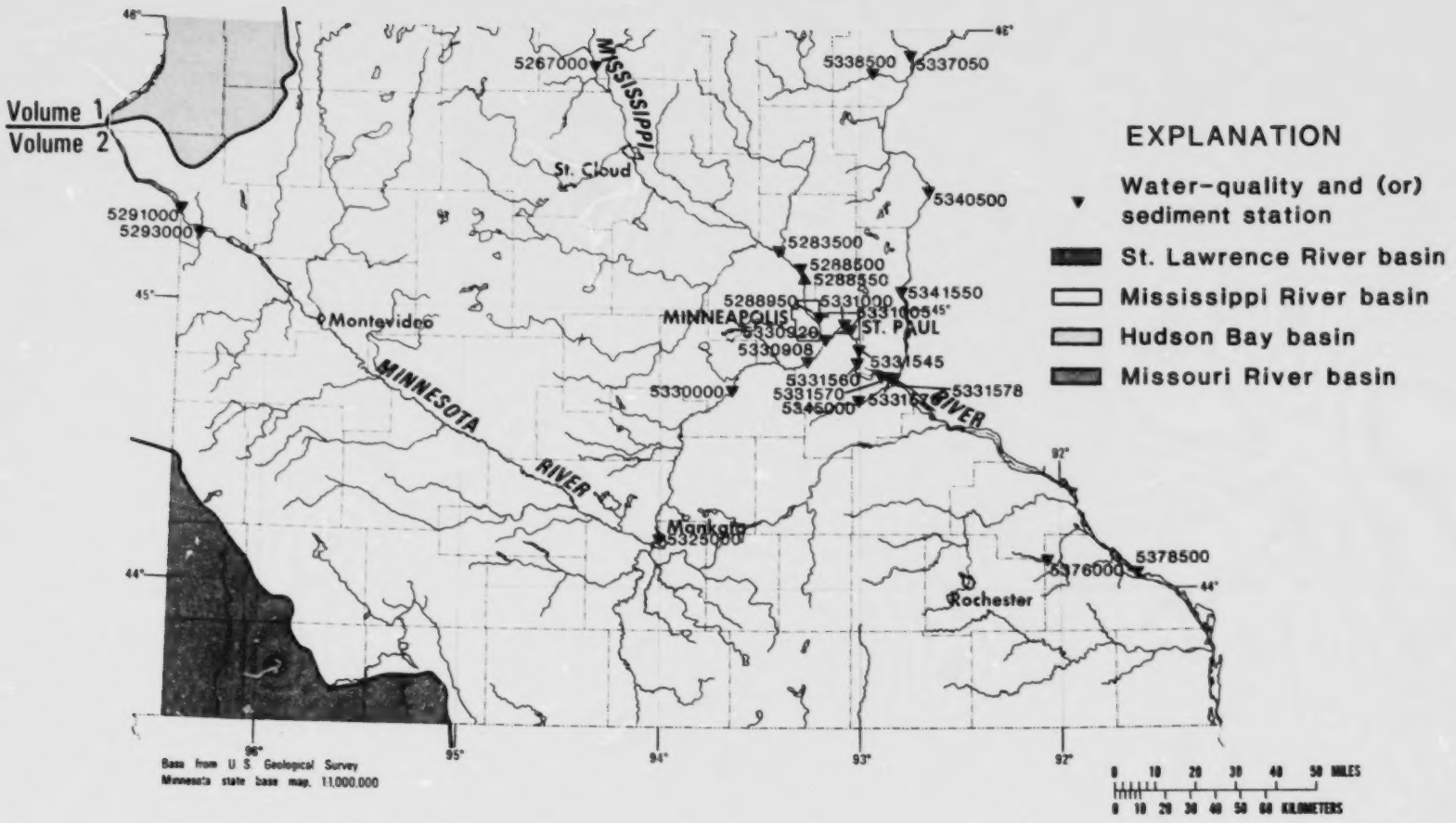


Figure 8.--Location of water-quality stations

BEST COPY AVAILABLE

HYDROLOGIC-DATA STATION RECORDS

STREAMS TRIBUTARY TO LAKE SUPERIOR

04010500 PIGEON RIVER AT MIDDLE FALLS, NEAR GRAND PORTAGE, MN
(International gaging station)

LOCATION.--Lat 48°00'44", long 89°36'58", in SW¼NE¼ sec.24, T.64 N., R.6 E., Cook County, Hydrologic Unit 04010101, on the Grand Portage Indian Reservation, on right bank 400 ft (122 m) upstream from Middle Falls, 2.5 mi (4.0 km) upstream from Grand Portage Port of Entry, 3.5 mi (5.6 km) upstream from mouth, and 4.7 mi (7.6 km) northeast of village of Grand Portage.

DRAINAGE AREA.--600 mi^2 (1,554 km^2).

PERIOD OF RECORD.--June to October 1921, April to November 1922, March 1923 to current year. Published as "at International Bridge" April 1924 to September 1940; as "below International Bridge" October 1940 to September 1965. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 744: 1927-28. WSP 804: 1934(M). WSP 974: Drainage area. WSP 1337: 1924(M), 1925, 1926-28(M), 1931(M), 1938(M), 1941(M), 1945-46(M), 1947, 1948(M), 1950(M).

GAGE.--Water-stage recorder. Datum of gage is 787.58 ft (240.054 m), National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1940, nonrecording gage at International Bridge, 5.8 mi (9.3 km) upstream at datum 102.24 ft (31.163 m) higher. Oct. 1, 1940, to Dec. 31, 1975, at present site at datum 2.00 ft (0.610 m) higher.

REMARKS.--Records good except those for winter period, which are fair.

COOPERATION.--This station is one of the international gaging stations maintained by the United States under agreement with Canada.

AVERAGE DISCHARGE.--60 years (water years 1924-83), 506 ft^3/s (14.33 m^3/s), 11.45 in/yr (291 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 11,000 ft^3/s (312 m^3/s) May 5, 1934, gage height, 7.6 ft (2.32 m), site and datum then in use, from rating curve extended above 7,000 ft^3/s (198 m^3/s); minimum daily, 1.0 ft^3/s (0.028 m^3/s) Jan. 15-21, 1977; minimum recorded gage height, 1.24 ft (0.378 m) Jan. 7, 8, 15, 1977, but may have been less during period of no gage-height record, Jan. 16 to Apr. 17, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,360 ft^3/s (95.2 m^3/s) Apr. 27, gage height, 8.49 ft (2.588 m), no other peak above base of 3,000 ft^3/s (85.0 m^3/s); maximum gage height, 9.49 ft (2.893 m) probably occurred Nov. 21, from highwater mark (backwater from ice); minimum discharge, 140 ft^3/s (3.96 m^3/s) Sept. 29, gage height, 2.91 ft (0.887 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	170	814	850	410	325	200	230	2330	1290	468	311	186
2	176	758	800	405	320	200	230	2290	1240	504	308	178
3	191	862	750	400	315	205	230	2380	1190	731	307	173
4	196	1060	700	390	310	210	235	2360	1130	1640	294	168
5	195	1180	660	390	305	215	245	2150	1080	2010	282	169
6	270	1210	630	385	300	250	260	1980	1030	1770	271	164
7	1080	1140	600	385	295	310	280	1820	982	1350	262	156
8	1390	1080	570	380	285	300	320	1700	907	1100	254	152
9	1160	1010	550	380	280	295	365	1570	856	982	248	172
10	2000	982	530	375	270	285	425	1440	823	901	255	201
11	2500	978	520	375	260	275	480	1370	783	846	254	237
12	2200	970	510	375	255	265	520	1370	743	803	248	238
13	1900	842	500	370	250	260	570	1380	709	771	242	227
14	1600	806	490	370	245	250	520	1410	683	720	235	210
15	1330	842	490	365	240	245	470	1330	711	668	229	197
16	1140	862	480	365	235	240	530	1240	727	623	220	226
17	1010	778	470	365	230	235	520	1120	699	595	214	228
18	946	730	470	360	225	230	500	970	656	576	208	224
19	942	834	460	360	220	230	485	898	605	557	210	213
20	942	1590	460	360	220	230	514	874	562	532	204	205
21	902	2500	450	355	215	230	614	878	534	503	203	197
22	858	2200	450	355	215	230	754	890	530	477	199	189
23	810	1900	440	355	210	230	1020	924	539	448	189	182
24	770	1600	440	350	210	230	1260	1020	525	430	188	175
25	734	1300	430	350	210	230	1730	982	503	412	186	167
26	702	1200	430	345	205	230	2120	920	504	387	182	160
27	666	1100	430	345	205	230	3070	870	513	367	178	151
28	638	1000	420	340	205	230	3120	840	497	350	178	145
29	798	950	420	340	---	230	3020	870	459	337	231	176
30	930	900	410	335	---	230	2620	1120	445	324	231	495
31	882	---	410	330	---	230	---	1320	---	318	200	---
TOTAL	30028	33978	16220	11365	7060	7460	27257	42616	22455	22500	7221	5961
MEAN	969	1133	523	367	252	241	909	1375	749	726	233	199
MAX	2500	2500	850	410	325	310	3120	2380	1290	2010	311	495
MIN	170	730	410	330	205	200	230	840	445	318	178	145
CFSM	1.62	1.89	.87	.61	.42	.40	1.52	2.29	1.25	1.21	.39	.33
IN.	1.86	2.11	1.01	.70	.44	.46	1.69	2.64	1.39	1.39	.45	.37
AC-FT	59560	67400	32170	22540	14000	14800	54060	84530	44540	44630	14320	11820

CAL YR 1982 TOTAL 225319 MEAN 617 MAX 5110 MIN 92 CFSM 1.03 IN 13.97 AC-FT 446900
WTR YR 1983 TOTAL 234121 MEAN 641 MAX 3120 MIN 145 CFSM 1.07 IN 14.52 AC-FT 464400

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN

LOCATION.--Lat 47°20'07", long 91°12'06", in SE¼NE¼ sec.15, T.56 N., R.7 W., Lake County, Hydrologic Unit 04010101, on right bank 400 ft (122 m) upstream from bridge on U.S. Highway 61, 0.3 mi (0.5 km) upstream from mouth, 4 mi (6 km) northeast of Silver Bay, and 7 mi (11 km) northeast of village of Beaver Bay.

DRAINAGE AREA.--140 mi^2 (363 km^2).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1927 to current year. Monthly discharge only for some periods, published in WSP 1307.

REVISED RECORDS.--WSP 894: 1939. WSP 1337: 1933-34(M), 1935.

GAGE.--Water-stage recorder. Datum of gage is 613.65 ft (187.041 m) National Geodetic Vertical Datum of 1929 (Corps of Engineers bench mark). Prior to Oct. 5, 1934, nonrecording gage, and Oct. 5, 1934 to Nov. 22, 1978, water-stage recorder at site 370 ft (113 m) downstream and at datum 3.68 ft (1.122 m) lower.

REMARKS.--Records good except those for winter period, which are poor.

AVERAGE DISCHARGE.--56 years, 169 ft^3/s (4.786 m^3/s), 16.39 in/yr (416 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,000 ft^3/s (283 m^3/s) Sept. 24, 1977, gage height, 8.33 ft (2.539 m) site and datum then in use, from highwater mark in well, from rating curve extended above 4,200 ft^3/s (119 m^3/s) on basis of slope-area measurement of peak flow; maximum gage height, 11.06 ft (3.371 m) Apr. 12, 1965, site and datum then in use, from floodmark (backwater from ice); no flow Jan. 14 to Mar. 2, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 1,300 ft^3/s (36.8 m^3/s) and maximum (*):

Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)	Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)
Oct. 7	0200	*2,400	68.0	*10.29	3.136	Apr. 27	2030	2,090	59.2	9.97	3.039
Oct 10	0230	1,820	51.5	9.67	2.947	July 4	0930	1,440	40.8	9.25	2.819

Minimum discharge, 16 ft^3/s (0.45 m^3/s) Aug. 23, 24; minimum gage height, 5.63 ft (1.716 m) Aug. 24.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	212	140	49	40	30	70	952	351	180	37	39
2	102	188	125	49	40	30	80	1020	285	127	29	33
3	228	313	110	48	38	30	90	1060	260	561	35	28
4	203	436	100	48	37	32	100	1010	312	1340	36	25
5	167	370	94	47	37	37	119	828	422	1070	30	24
6	910	276	88	47	34	140	121	696	353	657	25	26
7	2330	221	82	46	32	300	107	605	272	409	21	24
8	1770	215	76	46	32	280	123	530	217	268	18	23
9	1200	197	69	46	31	250	142	455	185	193	18	22
10	1770	209	70	45	31	230	129	404	162	139	51	121
11	1490	279	68	45	32	210	172	387	165	111	55	133
12	1090	238	67	44	32	190	209	383	159	87	43	114
13	847	215	66	44	32	170	170	556	171	70	33	85
14	649	195	64	44	33	150	142	583	197	59	28	68
15	505	180	63	44	33	130	134	475	280	49	24	69
16	391	165	62	43	33	120	134	383	323	43	22	508
17	332	155	61	43	33	110	118	313	269	41	27	395
18	297	145	60	43	32	100	109	272	207	38	27	274
19	283	250	59	42	32	94	116	269	165	41	29	192
20	272	500	58	42	32	88	153	316	138	73	25	144
21	249	900	57	42	32	82	221	436	120	71	22	115
22	228	730	56	42	32	78	313	396	115	59	21	99
23	212	540	55	41	32	74	445	354	104	48	18	84
24	200	420	54	41	31	70	638	301	86	40	286	69
25	188	350	54	41	30	66	1210	259	73	37	367	60
26	178	270	53	41	30	62	1840	220	65	31	218	52
27	167	230	52	41	30	60	1880	199	56	27	148	47
28	160	200	52	40	30	57	1670	210	48	24	111	41
29	262	175	51	40	---	56	1330	329	41	23	85	159
30	294	160	50	40	---	57	1040	377	92	20	65	507
31	245	---	50	40	---	58	---	426	---	32	51	---
TOTAL	17286	8934	2166	1354	923	3441	13125	15004	5693	5968	2005	3580
MEAN	558	298	69.9	43.7	33.0	111	438	484	190	193	64.7	119
MAX	2330	900	140	49	40	300	1880	1060	422	1340	367	508
MIN	67	145	50	40	30	30	70	199	41	20	18	22
CFSM	3.99	2.13	.50	.31	.24	.79	3.13	3.46	1.36	1.38	.46	.85
IN.	4.59	2.37	.58	.36	.25	.91	3.49	3.99	1.51	1.59	.53	.95
AC-FT	34290	17720	4300	2690	1830	6830	26030	29760	11290	11840	3980	7100

CAL YR 1982	TOTAL	93764	MEAN 257	MAX 3360	MIN 19	CFSM 1.84	IN 24.91	AC-PT	186000	
WTR YR 1983	TOTAL	79479	MEAN 218	MAX 2330	MIN 18	CFSM 1.56	IN 21.12	AC-PT	157600	

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEARVER BAY, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1968 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1980 to September 1983 (discontinued).
WATER TEMPERATURES: October 1980 to September 1983 (discontinued).

INSTRUMENTATION.--Water-quality minimonitor since October 1980.

REMARKS.--Letter K indicates non-ideal colony count. Letter E indicates estimated value.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum, 167 micromhos Feb. 18, 1981; minimum, 32 micromhos Apr. 25, 1981, Nov. 23, 1982.
WATER TEMPERATURES: Maximum, 27.5°C July 14-15, 1983; minimum, 0.0°C several days during winter period.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 106 micromhos Aug. 23; minimum, 32 micromhos Nov. 23.
WATER TEMPERATURES: Maximum, 27.5°C July 14-15; minimum, 0.0°C several days during winter period.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
05...	1330	162	71	73	7.8	7.5	15.5	10.0	1.4	745	11.3
FEB											
01...	1415	40	96	93	7.3	7.2	-4.0	.0	2.0	748	13.4
MAY											
24...	1135	324	52	55	7.4	7.0	11.0	9.5	1.4	742	10.9
SEP											
13...	1250	88	81	81	7.6	7.1	12.0	12.0	1.1	754	7.7

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
OCT											
05...	102	K16	210	8.8	2.9	2.2	<.10	27	8.0	2.3	.20
FEB											
01...	93	K2	94	--	--	--	.40	38	12	2.6	.20
MAY											
24...	98	61	E760	6.7	2.1	1.8	.50	20	10	1.1	.20
SEP											
13...	72	60	K490	11	3.6	2.6	.40	36	10	2.2	.20

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT											
05...	9.6	2	<.100	.020	1.3	.010	<.010	<.010	1	.44	86
FEB											
01...	--	75	.360	.090	.60	.010	<.010	<.010	2	.22	95
MAY											
24...	7.0	55	.170	.050	.50	<.010	<.010	<.010	3	2.6	78
SEP											
13...	10	82	--	--	--	--	--	--	9	2.1	99

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA) (01007)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD) (01027)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOVERABLE (UG/L AS CO) (01037)
OCT												
05...	1330	--	2	2	100	12	--	1	<1	20	10	1
FEB												
01...	1415	20	--	3	--	--	--	--	--	--	<1	--
MAY												
24...	1135	90	--	1	--	12	<0	--	<1	--	<1	--
SEP												
13...	1250	50	--	1	--	10	<0	--	<1	--	5	--

DATE	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOVERABLE (UG/L AS CU) (01042)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOVERABLE (UG/L AS FE) (01045)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOVERABLE (UG/L AS PB) (01051)	LEAD, DISSOLVED (UG/L AS PB) (01049)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	NESE, TOTAL RECOVERABLE (UG/L AS MN) (01055)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOVERABLE (UG/L AS HG) (71900)	MERCURY DISSOLVED (UG/L AS HG) (71890)
OCT												
05...	<1	5	4	570	390	3	<1	--	10	5	.8	.2
FEB												
01...	--	--	10	--	--	--	2	--	--	--	--	--
MAY												
24...	<3	--	6	--	200	--	<1	<4	--	5	--	<.1
SEP												
13...	<3	--	32	--	420	--	<1	<4	--	6	--	.1

DATE	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI) (01067)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, TOTAL (UG/L AS SE) (01147)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOVERABLE (UG/L AS AG) (01077)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN) (01092)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT											
05...	--	2	1	<1	<1	<1	<1	--	--	80	10
FEB											
01...	--	--	2	--	--	--	<1	--	--	--	--
MAY											
24...	<10	--	<1	--	<1	--	<1	19	<6	--	<3
SEP											
13...	<10	--	2	--	<1	--	<1	34	<6	--	<3

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	75	73	74	60	55	56	60	58	59	79	78	79
2	86	74	79	61	59	60	60	59	60	79	78	79
3	82	69	74	64	60	63	60	54	57	80	78	79
4	70	67	68	61	57	58	55	53	54	82	80	81
5	68	66	67	58	57	57	54	53	54	81	80	81
6	75	53	63	58	57	58	57	53	55	82	80	81
7	52	42	46	60	58	59	62	56	59	82	81	81
8	43	41	42	60	59	59	66	61	64	81	80	81
9	48	42	44	60	59	60	68	62	65	82	80	81
10	47	42	43	63	59	61	67	63	64	82	81	81
11	43	42	42	63	61	62	71	66	70	82	80	81
12	44	42	43	63	60	61	72	71	72	82	80	81
13	45	44	44	66	63	65	72	71	71	82	81	82
14	47	45	46	66	63	65	72	71	72	82	81	82
15	48	46	47	66	64	65	73	71	72	82	81	82
16	49	48	49	66	64	65	75	73	74	83	81	82
17	51	49	50	66	64	65	77	74	76	83	82	82
18	52	51	51	67	65	66	77	76	76	84	81	82
19	53	52	52	66	62	65	77	76	77	84	82	83
20	54	52	53	61	43	52	77	76	77	85	83	84
21	54	52	53	43	40	41	78	76	77	85	84	84
22	53	52	53	43	33	41	78	77	78	86	84	85
23	54	53	54	35	32	33	90	77	82	86	85	86
24	55	53	54	37	34	36	88	80	82	86	85	86
25	56	54	55	39	36	38	81	78	79	86	85	85
26	56	55	56	41	39	40	78	78	78	87	85	86
27	58	56	57	43	41	42	79	78	79	88	86	87
28	58	57	58	44	42	43	79	74	76	89	88	89
29	63	58	61	44	43	44	79	73	77	89	89	89
30	58	55	56	59	44	55	79	78	78	89	87	88
31	56	54	55	---	---	---	79	78	79	88	87	87
MONTH	86	41	54	67	32	55	90	53	71	89	78	83

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	89	87	88	99	98	98	92	89	90	42	40	41
2	89	88	89	98	98	98	90	87	89	41	40	41
3	90	89	89	98	98	98	88	86	87	41	39	40
4	90	90	90	98	97	97	88	85	87	40	39	40
5	91	90	91	102	98	100	86	82	85	41	39	40
6	91	90	90	102	73	92	84	82	83	42	40	41
7	93	91	92	73	66	70	87	85	86	43	40	42
8	93	92	93	66	62	64	89	71	84	44	41	43
9	94	92	93	62	59	61	83	67	78	45	43	44
10	94	93	93	63	59	61	83	81	82	46	44	45
11	93	93	93	63	59	61	83	73	79	47	45	46
12	94	93	93	64	61	63	75	73	74	47	46	47
13	94	93	94	65	63	64	76	73	75	50	46	48
14	95	93	94	66	64	65	77	73	75	47	45	46
15	96	95	95	66	65	66	80	75	76	47	46	46
16	97	95	96	68	66	67	79	76	77	48	46	47
17	98	96	97	69	67	69	81	77	79	49	47	48
18	98	96	97	71	69	70	83	79	82	50	48	49
19	97	96	96	73	71	72	84	82	83	52	50	51
20	98	96	96	75	72	74	84	79	82	54	51	52
21	98	97	97	77	74	75	79	74	77	54	48	51
22	98	96	97	78	75	77	75	67	71	49	48	49
23	101	98	99	81	75	79	67	59	64	50	49	49
24	98	92	97	81	73	77	60	51	57	50	49	49
25	99	90	96	82	78	80	51	40	47	51	49	50
26	99	98	98	83	72	79	40	38	39	52	50	51
27	99	98	98	84	82	83	39	37	38	53	51	52
28	99	98	99	86	79	83	38	36	37	56	52	54
29	---	---	---	87	78	83	40	37	39	56	51	53
30	---	---	---	87	85	86	41	39	40	51	49	50
31	---	---	---	92	86	87	---	---	---	51	48	50
MONTH	101	87	94	102	59	77	92	36	71	56	39	47

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	49	48	48	76	69	71	96	94	95	84	80	82
2	50	48	49	69	67	68	96	93	95	88	83	86
3	52	50	51	70	54	64	99	93	96	90	87	89
4	52	51	52	55	43	48	99	96	97	93	90	91
5	52	48	49	43	42	42	99	96	98	95	91	93
6	49	48	49	45	43	44	100	97	99	95	93	94
7	50	48	49	48	44	46	103	98	100	96	94	95
8	52	50	51	52	48	50	104	100	102	98	95	96
9	53	52	53	56	51	54	103	100	101	99	96	98
10	56	53	54	59	55	57	100	92	96	99	71	88
11	57	55	56	63	58	61	97	95	97	88	81	83
12	57	56	57	66	62	64	95	93	95	81	78	80
13	59	57	58	70	66	68	96	93	95	---	---	---
14	59	56	57	81	70	72	99	96	98	---	---	---
15	59	54	57	77	73	75	101	98	99	---	---	---
16	56	52	54	80	77	78	102	99	101	---	---	---
17	53	52	52	82	79	81	103	100	102	---	---	---
18	54	52	53	84	81	83	102	98	101	---	---	---
19	56	54	55	86	80	84	105	101	103	---	---	---
20	58	56	57	89	81	85	103	101	102	---	---	---
21	61	58	59	83	81	82	103	101	102	---	---	---
22	65	61	63	83	82	82	105	102	103	---	---	---
23	66	64	65	85	83	84	106	102	104	---	---	---
24	68	65	66	87	84	86	105	70	86	---	---	---
25	72	67	69	89	85	87	70	65	67	---	---	---
26	74	71	73	90	87	88	66	65	66	---	---	---
27	75	73	74	92	88	90	69	66	67	---	---	---
28	77	75	76	94	91	92	72	68	70	---	---	---
29	79	77	78	97	93	95	74	72	73	---	---	---
30	82	74	78	97	95	96	77	74	76	---	---	---
31	---	---	---	99	92	96	80	77	79	---	---	---
MONTH	82	48	59	99	42	73	106	65	92	---	---	---

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	11.5	9.5	10.5	4.5	2.5	3.5	.0	.0	.0	.0	.0	.0
2	10.5	9.5	10.0	4.0	2.5	3.5	.0	.0	.0	.0	.0	.0
3	11.5	8.5	10.0	4.0	2.0	3.5	.0	.0	.0	.0	.0	.0
4	11.0	8.0	9.5	2.0	1.0	1.0	.0	.0	.0	.0	.0	.0
5	11.5	9.0	10.5	1.0	.0	.5	.0	.0	.0	.0	.0	.0
6	10.5	8.5	9.0	1.0	.0	.0	.0	.0	.0	.0	.0	.0
7	8.5	8.0	8.5	1.5	.0	.5	.0	.0	.0	.0	.0	.0
8	8.5	8.0	8.0	1.5	.0	1.0	.0	.0	.0	.0	.0	.0
9	8.0	8.0	8.0	1.0	.0	.5	.0	.0	.0	.0	.0	.0
10	9.0	8.0	8.5	1.0	1.0	1.0	.0	.0	.0	.0	.0	.0
11	9.0	8.5	9.0	1.5	1.0	1.0	.0	.0	.0	.0	.0	.0
12	9.5	8.5	9.0	1.0	.0	.0	.0	.0	.0	.0	.0	.0
13	9.0	8.5	9.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	10.0	8.0	9.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	8.5	6.5	7.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	7.0	5.5	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	6.0	5.0	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	7.0	4.0	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	7.0	5.0	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	5.0	3.0	4.0	1.0	.0	.5	.0	.0	.0	.0	.0	.0
21	4.0	2.5	3.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	4.0	1.5	3.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	4.5	1.5	3.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	5.5	2.5	4.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	6.5	3.5	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	7.0	4.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	6.5	4.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	7.5	6.0	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	7.5	7.0	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	6.5	4.0	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
31	5.0	3.0	4.0	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	11.5	1.5	7.0	4.5	.0	.5	.0	.0	.0	.0	.0	.0

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	---	---	---
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	---	---	---
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	---	---	---
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	---	---	---
5	.0	.0	.0	.0	.0	.0	.0	.0	.0	6.0	1.0	3.5
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	6.5	3.0	4.5
7	.0	.0	.0	.0	.0	.0	1.0	.0	.0	7.0	2.0	4.0
8	.0	.0	.0	.0	.0	.0	1.5	.0	.0	7.0	2.5	4.5
9	.0	.0	.0	.0	.0	.0	.0	.0	.0	7.0	2.5	4.5
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	9.5	4.5	6.5
11	.0	.0	.0	.0	.0	.0	.0	.0	.0	---	---	---
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	10.0	7.5	9.0
13	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	7.5	9.5
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	10.5	7.5	9.0
15	.0	.0	.0	.0	.0	.0	.0	.0	.0	9.5	5.5	7.5
16	.0	.0	.0	.0	.0	.0	.0	.0	.0	9.5	5.0	7.5
17	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	5.0	8.0
18	.0	.0	.0	.0	.0	.0	.0	.0	.0	14.5	8.5	11.0
19	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.0	9.0	10.5
20	.0	.0	.0	.0	.0	.0	.0	.0	.0	9.0	8.0	8.5
21	.0	.0	.0	.0	.0	.0	---	---	---	12.0	7.0	9.0
22	.0	.0	.0	.0	.0	.0	---	---	---	11.0	9.0	9.5
23	.0	.0	.0	.0	.0	.0	---	---	---	12.0	8.0	10.0
24	.0	.0	.0	.0	.0	.0	---	---	---	12.5	9.0	10.5
25	.0	.0	.0	.0	.0	.0	---	---	---	12.5	7.5	10.0
26	.0	.0	.0	.0	.0	.0	---	---	---	12.5	7.5	10.0
27	.0	.0	.0	.0	.0	.0	---	---	---	13.5	8.5	11.0
28	.0	.0	.0	.0	.0	.0	---	---	---	11.5	9.0	9.5
29	---	---	---	.0	.0	.0	---	---	---	9.5	8.5	9.0
30	---	---	---	.0	.0	.0	---	---	---	9.0	8.5	8.5
31	---	---	---	.0	.0	.0	---	---	---	13.5	8.0	10.5
MONTH	.0	.0	.0	.0	.0	.0	---	---	---	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	12.5	9.0	11.0	20.5	15.5	17.5	23.0	18.5	20.5	21.5	18.0	20.0
2	15.0	9.5	12.0	18.5	15.5	16.5	22.5	19.5	21.0	24.5	20.5	22.5
3	13.0	11.5	12.0	18.0	14.5	16.0	23.0	20.5	21.5	23.0	21.5	22.0
4	12.0	10.5	11.0	16.0	14.5	15.0	24.0	20.0	22.0	21.0	19.5	20.0
5	12.0	9.5	11.0	16.0	13.0	14.5	24.5	20.5	22.5	20.5	18.5	19.0
6	15.0	9.0	12.0	18.0	13.0	15.5	26.0	22.5	24.0	18.5	16.0	17.5
7	15.0	10.0	12.5	21.0	16.0	18.5	26.5	21.0	23.5	17.0	14.5	15.5
8	13.0	11.0	11.5	23.0	18.5	20.5	25.5	21.5	23.5	18.5	14.5	16.0
9	16.0	9.0	12.5	22.0	18.5	20.0	21.5	19.0	20.0	19.5	17.0	18.5
10	14.5	11.0	13.0	22.0	17.5	19.5	18.5	17.5	18.0	18.5	15.5	17.5
11	20.0	12.0	16.0	24.0	19.0	21.5	20.5	16.5	18.5	15.5	13.0	14.0
12	18.0	16.0	17.0	24.0	18.5	21.5	20.5	17.0	18.5	14.5	12.5	13.5
13	19.5	16.5	17.5	24.0	19.0	22.0	19.5	17.0	18.5	---	---	---
14	18.5	17.0	17.5	27.5	22.5	25.0	23.5	19.0	21.0	---	---	---
15	17.0	15.0	16.0	27.5	23.0	25.5	22.5	19.5	21.0	---	---	---
16	16.0	13.5	14.5	26.0	23.5	24.5	21.5	19.5	20.5	---	---	---
17	16.0	12.0	14.0	25.0	22.5	24.0	22.5	20.0	21.0	---	---	---
18	17.5	11.5	14.5	23.5	21.0	22.0	22.5	19.5	21.0	---	---	---
19	18.0	12.5	15.5	24.0	20.0	22.0	23.5	20.5	22.0	---	---	---
20	17.5	14.0	16.0	22.5	19.5	21.5	20.0	18.0	19.0	---	---	---
21	18.5	15.0	16.5	22.0	20.0	21.0	19.5	17.5	18.5	---	---	---
22	22.5	16.5	19.0	21.5	18.5	20.0	22.0	17.5	19.5	---	---	---
23	23.0	17.5	20.5	23.0	19.5	21.5	21.5	17.5	19.0	---	---	---
24	21.5	17.5	20.0	22.0	20.0	21.0	18.0	15.5	17.0	---	---	---
25	23.0	18.0	20.5	22.5	18.0	20.0	21.5	17.0	19.0	---	---	---
26	23.5	21.0	22.0	22.5	18.5	20.5	23.0	19.0	21.0	---	---	---
27	20.5	16.0	17.5	23.0	19.0	21.0	23.5	19.0	21.5	---	---	---
28	17.5	12.5	15.5	24.0	20.5	22.0	23.0	19.5	21.0	---	---	---
29	16.5	14.0	15.0	26.0	21.5	23.5	21.5	19.5	20.5	---	---	---
30	18.5	14.0	16.0	22.5	19.0	21.0	21.5	19.0	20.5	---	---	---
31	---	---	---	21.5	18.5	19.5	21.0	18.0	20.0	---	---	---
MONTH	23.5	9.0	15.5	27.5	13.0	20.5	26.5	15.5	20.5	---	---	---

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04015330 KNIFE RIVER NEAR TWO HARBORS, MN

LOCATION.--Lat 46°56'49", long 91°47'32", in SW¼NW¼ sec.31, T.52 N., R.11 W., Lake County, Hydrologic Unit 04010102, on right bank 600 ft (183 m) downstream from bridge on U.S. Highway 61, 0.5 mi (0.8 km) upstream from bridge on County Highway 102, in town of Knife River, 0.8 mi (1.3 km) upstream from Lake Superior, and 7.8 mi (12.6 km) southwest of Two Harbors.

DRAINAGE AREA.--85.6 mi^2 (221.7 km^2).

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1970-71, July 1974 to current year.

GAGE.--Water-stage recorder and crest-stage gage. Altitude of gage is 640 ft (195 m), from topographic map.

REMARKS.--Records fair except those for winter period and those for periods of no gage height record, Nov. 13 to Dec. 7, Dec. 17 to Feb. 2, and Apr. 7 to May 26, which are poor.

AVERAGE DISCHARGE.--9 years, 88.6 ft^3/s (2.509 m^3/s), 14.06 in/yr (357 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,440 ft^3/s (211 m^3/s) May 10, 1979, gage height, 11.16 ft (3.402 m); minimum, no flow Dec. 2, 1976 to Mar. 4, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharges above base of 800 ft^3/s (22.7 m^3/s) and maximum (*):

Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)
Oct. 6	1045	2,080	58.9	6.82	2.079
Oct. 7	0300	1,440	40.8	6.04	1.841
Oct. 10	0145	1,310	37.1	5.86	1.786
Nov. 21	unknown	*2,580	73.1	*7.35	2.240
Apr. 26	unknown	1,440	40.8	6.04	1.841
July 3	1915	1,470	41.6	5.98	1.823
Sept.16	0800	818	23.2	5.16	1.573

Minimum discharge, 4.5 ft^3/s (0.13 m^3/s) Aug. 9, 10, gage height, 2.60 ft (0.792 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	87	130	30	15	18	271	400	92	70	7.8	9.8
2	88	73	120	30	15	18	315	450	75	66	7.8	8.2
3	200	133	110	25	15	19	281	500	65	454	11	7.8
4	109	151	105	25	14	20	296	450	69	939	14	7.0
5	75	116	100	25	14	25	336	400	76	510	10	7.0
6	1030	91	95	25	14	90	278	350	73	238	9.4	7.0
7	1020	75	85	25	14	160	250	300	60	126	7.8	7.0
8	450	82	80	25	14	150	230	250	48	79	5.9	6.7
9	438	73	75	25	14	140	210	200	42	52	4.5	6.7
10	923	128	70	25	14	120	190	170	37	39	91	30
11	474	205	65	25	14	110	170	140	34	32	114	62
12	314	138	60	20	14	100	150	160	33	25	53	34
13	218	120	60	20	14	90	140	180	32	21	29	24
14	157	110	55	20	15	80	130	180	32	17	19	18
15	119	95	55	20	15	75	120	150	59	15	13	43
16	93	85	50	20	15	70	110	120	88	14	10	662
17	87	80	50	20	16	65	100	100	71	12	10	318
18	79	75	45	20	16	60	95	90	51	12	9.8	160
19	71	100	45	20	16	55	90	100	39	11	8.6	91
20	82	500	45	20	16	50	120	120	32	11	7.4	61
21	85	1200	40	20	16	45	150	130	28	21	7.0	44
22	73	370	40	20	16	45	200	120	33	37	9.0	34
23	65	300	40	20	17	40	300	100	29	24	10	28
24	61	250	35	15	17	40	500	80	29	17	13	23
25	58	220	35	15	17	35	700	70	25	13	62	20
26	53	190	35	15	17	35	1100	60	21	11	38	21
27	50	180	35	15	17	35	900	55	71	9.4	43	17
28	50	165	30	15	18	35	700	58	50	8.2	24	14
29	193	150	30	15	---	35	600	92	31	7.8	18	29
30	168	140	30	15	---	35	500	105	31	7.4	15	163
31	110	---	30	15	---	54	---	115	---	7.0	12	---
TOTAL	7013	5682	1880	645	429	1949	9532	5795	1456	2905.8	694.0	1963.2
MEAN	226	189	60.6	20.8	15.3	62.9	318	187	48.5	93.7	22.4	65.4
MAX	1030	1200	130	30	18	160	1100	500	92	939	114	662
MIN	20	73	30	15	14	18	90	55	21	7.0	4.5	6.7
CFSM	2.64	2.21	.71	.24	.18	.74	3.72	2.19	.57	1.10	.26	.76
IN.	3.05	2.47	.82	.28	.19	.85	4.14	2.52	.63	1.26	.30	.85
AC-FT	13910	11270	3730	1280	851	3870	18910	11490	2890	5760	1380	3890

CAL YR 1982 TOTAL 52063.9 MEAN 143 MAX 1580 MIN 3.5 CFSM 1.67 IN 22.63 AC-FT 103300
WTR YR 1983 TOTAL 39944.0 MEAN 109 MAX 1200 MIN 4.5 CFSM 1.27 IN 17.36 AC-FT 79230

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04015475 PARTRIDGE RIVER ABOVE COLBY LAKE, AT HOYT LAKES, MN

LOCATION.--Lat 47°31'38", long 92°07'21", in SW¼NE¼ sec.9, T.58 N., R.14 W., St. Louis County, Hydrologic Unit 04010201, in Superior National Forest, 10 ft (3.0 m) upstream from bridge on County Highway 110, 1 mi (1.6 km) east of Hoyt Lakes.

DRAINAGE AREA.--106 mi^2 (275 km^2) of which 6.0 mi^2 (15.5 km^2) is noncontributing.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1978 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,455 ft (443 m), from topographic map.

REMARKS.--Records fair except those for winter period, which are poor.

AVERAGE DISCHARGE.--5 years, 88.8 ft^3/s (2.515 m^3/s), 11.38 in/yr (289 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,020 ft^3/s (57.2 m^3/s) Apr. 22, 1979, gage height, 10.89 ft (3.319 m); minimum, 0.88 ft^3/s (0.025 m^3/s) Feb. 15, 1981, gage height, 4.81 ft (1.466 m).

EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 0.50 ft^3/s (0.014 m^3/s) was measured Aug. 23, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 779 ft^3/s (22.1 m^3/s) Oct. 12, gage height, 8.59 ft (2.618 m); minimum, 6.5 ft^3/s (0.18 m^3/s) Aug. 9, 10, 11, gage height, 5.10 ft (1.554 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	88	134	95	16	14	13	23	328	160	43	20	106
2	103	134	90	16	14	13	30	278	146	55	18	92
3	157	169	92	16	14	13	40	244	136	154	18	82
4	205	200	94	16	14	13	60	227	139	268	16	73
5	216	222	85	15	14	14	80	220	146	350	13	69
6	258	213	70	15	14	15	110	218	148	404	11	66
7	410	196	58	15	14	19	138	200	139	423	9.2	66
8	552	175	50	15	14	27	151	181	125	380	8.4	65
9	664	173	45	15	14	49	175	167	114	291	7.1	63
10	750	165	40	15	14	48	184	156	104	211	6.5	63
11	771	150	38	14	13	46	187	152	102	160	12	75
12	775	145	36	14	13	44	209	146	97	130	18	85
13	754	136	34	14	13	41	222	156	90	109	21	78
14	676	120	32	14	13	39	198	169	87	93	22	65
15	576	110	30	14	13	36	143	179	100	78	20	56
16	482	97	28	14	13	34	183	169	120	63	18	56
17	380	90	26	14	13	31	145	152	124	54	15	57
18	301	87	25	14	13	29	114	141	112	47	13	56
19	258	102	24	14	13	27	104	134	99	40	11	53
20	227	229	23	14	13	25	115	130	85	35	10	48
21	207	386	22	14	13	23	160	136	80	35	9.8	43
22	191	468	22	14	13	21	204	139	85	31	9.1	43
23	171	450	21	14	13	20	248	141	82	28	11	41
24	154	400	20	14	13	19	293	141	72	25	100	38
25	145	300	19	14	13	18	331	139	60	25	200	37
26	137	250	18	14	13	17	371	132	51	24	260	35
27	127	190	18	14	13	17	404	120	46	23	280	32
28	120	150	17	14	13	16	423	112	40	22	300	29
29	124	123	17	14	---	16	414	124	36	22	286	28
30	134	100	17	14	---	16	377	141	35	22	200	46
31	137	---	16	14	---	18	---	156	---	22	135	---
TOTAL	10250	5864	1222	448	374	777	5836	5228	2960	3667	2078.1	1746
MEAN	331	195	39.4	14.5	13.4	25.1	195	169	98.7	118	67.0	58.2
MAX	775	468	95	16	14	49	423	328	160	423	300	106
MIN	88	87	16	14	13	13	23	112	35	22	6.5	28
CFSM	3.12	1.84	.37	.14	.13	.24	1.84	1.59	.93	1.11	.63	.55
IN.	3.60	2.06	.43	.16	.13	.27	2.05	1.83	1.04	1.29	.73	.61
AC-FT	20330	11630	2420	889	742	1540	11580	10370	5870	7270	4120	3460

CAL YR 1982	TOTAL	47883.0	MEAN 131	MAX 775	MIN 2.7	CFSM 1.24	IN 16.80	AC-FT	94980	
WTR YR 1983	TOTAL	40450.1	MEAN 111	MAX 775	MIN 6.5	CFSM 1.05	IN 14.20	AC-FT	80230	

BEST COPY AVAILABLE

04015475 PARTRIDGE RIVER ABOVE COLBY LAKE AT HOYT LAKES, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--February 1976 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: February 1976 to current year.
WATER TEMPERATURES: February 1976 to current year.

INSTRUMENTATION.--Specific conductance and water temperature recorder since February 1976.

REMARKS.--Extremes are published for years with 80 percent or more daily record.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water year 1980): Maximum, 268 micromhos Aug. 28 and 29, 1980; minimum, 63 micromhos April 11, 1980.
WATER TEMPERATURES (water years 1979, 1980): Maximum, 27.5°C June 25, 1980; minimum, 0.0°C on many days during winter periods.

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---									
2	---	---	---									
3	---	---	---									
4	---	---	---									
5	---	---	---									
6	76	67	72									
7	67	55	61									
8	55	49	52									
9	50	45	47									
10	45	43	44									
11	44	43	43									
12	44	44	44									
13	45	44	44									
14	49	46	48									
15	52	49	51									
16	56	52	54									
17	60	57	59									
18	63	60	61									
19	66	64	65									
20	69	66	67									
21	71	69	70									
22	72	71	72									
23	---	---	---									
24	---	---	---									
25	---	---	---									
26	---	---	---									
27	---	---	---									
28	---	---	---									
29	---	---	---									
30	---	---	---									
31	---	---	---									

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04015475 PARTRIDGE RIVER ABOVE COLBY LAKE AT HOYT LAKES, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---									
2	---	---	---									
3	---	---	---									
4	---	---	---									
5	---	---	---									
6	---	---	---									
7	---	---	---									
8	---	---	---									
9	---	---	---									
10	---	---	---									
11	---	---	---									
12	154	151	153									
13	151	147	149									
14	147	145	146									
15	146	144	145									
16	144	143	143									
17	144	143	143									
18	146	144	146									
19	146	145	146									
20	145	140	143									
21	140	137	138									
22	137	135	136									
23	---	---	---									
24	---	---	---									
25	---	---	---									
26	---	---	---									
27	---	---	---									
28	---	---	---									
29	---	---	---									
30	---	---	---									
31	---	---	---									

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1				---	---	---	116	114	115	91	88	90
2				---	---	---	120	116	118	97	91	94
3				---	---	---	124	120	122	104	96	101
4				---	---	---	133	124	128	111	94	108
5				---	---	---	139	134	137	115	111	113
6				---	---	---	146	138	142	118	114	116
7				---	---	---	150	144	147	122	117	119
8				---	---	---	152	148	150	127	122	124
9				---	---	---	153	150	152	128	126	127
10				---	---	---	152	146	147	128	125	127
11				---	---	---	155	146	150	130	127	128
12				---	---	---	165	155	159	138	130	134
13				---	---	---	167	165	166	139	135	137
14				---	---	---	174	167	171	136	130	133
15				---	---	---	174	172	173	130	124	127
16				---	---	---	174	172	173	124	121	122
17				---	---	---	173	172	173	121	120	121
18				---	---	---	174	173	173	127	121	124
19				---	---	---	173	171	172	131	126	129
20				---	---	---	172	170	171	132	129	130
21				109	107	108	171	169	170	130	127	128
22				108	106	107	170	168	169	127	123	125
23				107	106	107	170	167	169	123	122	123
24				108	107	107	168	103	131	122	121	122
25				108	107	107	116	86	97	122	121	122
26				108	107	107	85	69	76	127	122	125
27				108	107	108	69	67	68	131	126	129
28				109	108	109	71	67	69	132	130	131
29				112	109	110	77	71	74	131	129	130
30				113	111	112	83	77	80	130	128	129
31				113	112	113	88	83	86	---	---	---
MONTH				---	---	---	174	67	136	139	88	122

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04015475 PARTRIDGE RIVER ABOVE COLBY LAKE AT HOYT LAKES, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---									
2	---	---	---									
3	---	---	---									
4	---	---	---									
5	---	---	---									
6	10.5	9.5	10.0									
7	9.5	8.5	9.0									
8	9.0	8.5	8.5									
9	8.5	8.0	8.0									
10	9.0	8.0	8.5									
11	9.0	8.5	8.5									
12	9.0	8.5	9.0									
13	9.0	8.5	8.5									
14	9.0	8.0	8.5									
15	8.5	7.5	8.0									
16	7.5	6.5	7.0									
17	6.5	6.0	6.0									
18	6.0	5.5	6.0									
19	6.0	5.5	6.0									
20	5.0	4.0	4.5									
21	4.5	3.5	4.0									
22	4.5	3.0	4.0									
23	---	---	---									
24	---	---	---									
25	---	---	---									
26	---	---	---									
27	---	---	---									
28	---	---	---									
29	---	---	---									
30	---	---	---									
31	---	---	---									

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1				---	---	---	24.5	21.5	22.5	22.5	20.5	21.5
2				---	---	---	23.5	21.5	22.5	24.0	21.5	22.5
3				---	---	---	24.0	22.0	23.0	24.0	23.0	23.0
4				---	---	---	26.5	22.0	23.5	22.5	22.0	22.5
5				---	---	---	26.0	23.5	24.5	22.5	21.0	21.5
6				---	---	---	26.0	23.0	24.5	21.0	19.0	20.0
7				---	---	---	25.5	23.0	24.0	19.0	18.0	18.5
8				---	---	---	25.5	23.0	24.0	20.5	17.5	19.0
9				---	---	---	24.0	22.0	23.0	20.0	19.5	20.0
10				---	---	---	22.5	20.5	21.0	20.0	18.5	19.5
11				---	---	---	23.0	19.5	21.0	18.5	16.5	17.0
12				---	---	---	24.0	20.0	22.0	16.5	16.0	16.5
13				---	---	---	23.5	21.5	22.0	16.0	15.0	15.5
14				---	---	---	25.0	20.5	22.5	15.5	14.0	14.5
15				---	---	---	24.5	21.0	23.0	14.5	13.0	14.0
16				---	---	---	24.0	22.5	23.0	13.0	12.5	13.0
17				---	---	---	25.0	22.0	23.0	13.0	12.0	12.5
18				---	---	---	25.5	22.5	24.0	14.0	12.5	13.5
19				---	---	---	25.0	23.5	24.0	13.5	12.0	12.5
20				---	---	---	23.0	21.0	22.0	12.0	11.0	11.5
21				26.0	23.5	24.5	21.5	20.5	21.0	11.0	10.5	10.5
22				26.5	23.5	24.5	22.5	20.0	21.0	10.5	9.5	10.0
23				25.0	23.0	24.0	22.5	19.5	21.0	10.5	8.5	9.5
24				24.0	22.5	23.0	21.0	18.0	20.0	11.5	9.5	10.5
25				24.0	21.5	22.5	21.5	19.5	20.5	12.5	10.0	11.0
26				24.5	21.5	23.0	22.0	20.5	21.5	13.5	11.0	12.0
27				25.0	22.5	23.5	22.0	20.5	21.5	15.0	12.0	13.5
28				25.5	23.0	24.0	22.0	20.5	21.0	16.0	14.0	15.0
29				25.5	23.0	24.0	21.0	20.5	21.0	16.0	14.5	15.0
30				24.0	22.5	23.0	22.0	20.0	21.0	14.5	14.0	14.0
31				24.0	22.0	23.0	22.0	20.0	21.0	---	---	---
MONTH				---	---	---	26.5	18.0	22.0	24.0	8.5	15.5

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04016500 ST. LOUIS RIVER NEAR AURORA, MN

LOCATION.--Lat 47°29'30", long 92°14'20", in NW¼SW¼ sec.22, T.58 N., R.15 W., St. Louis County, Hydrologic Unit 04010201, on left bank at upstream side of highway bridge, 0.8 mi (1.3 km) downstream from Partridge River and 1.5 mi (2.4 km) south of Aurora.

DRAINAGE AREA.--290 mi^2 (751 km^2) of which 13.3 mi^2 (34.4 km^2) is noncontributing.

PERIOD OF RECORD.--August 1942 to current year.

REVISED RECORDS.--WSP 1337: 1950. WDR MN-77-1: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 1,371.24 ft (417.954 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 26, 1944, nonrecording gage at same site and datum.

REMARKS.--Records good except those for winter period and those for period of no gage-height record, Oct. 13 to Nov. 29, which are fair. Flow regulated at times by storage in off-channel Partridge Reservoir, formerly known as Whitewater Lake. Reservoir formed from lake by levees around marsh areas and natural outlet. Available capacity 20,000 acre-ft (24.7 hm3) between elevations 1,410 ft (430 m), natural lake level, and 1,440 ft (439 m). Storage in reservoir obtained from Colby Lake during periods of high flow; release from storage returned to Colby Lake to maintain lake elevation during diversion for iron-ore processing. Diversion began Feb. 7, 1956. Some seepage losses from reservoir enter above station. Flow also affected by mining activities in Second Creek (station 04015500) basin.

AVERAGE DISCHARGE (adjusted for storage and diversion).--41 years, 248 ft^3/s (7.023 m^3/s), 11.61 in/yr (295 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,380 ft^3/s (152 m^3/s) May 14, 1950, gage height, 8.37 ft (2.551 m); minimum daily, 4.0 ft^3/s (0.11 m^3/s) Jan. 29 to Feb. 10, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,590 ft^3/s (45.0 m^3/s) Oct. 12, gage height, 4.43 ft (1.350 m); minimum daily, 44 ft^3/s (1.25 m^3/s) Aug. 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	278	400	420	93	70	65	85	834	377	177	89	390
2	325	400	400	92	70	65	100	777	365	177	89	338
3	400	450	410	91	70	65	130	723	375	417	91	314
4	461	500	390	90	69	65	170	667	370	647	82	292
5	470	520	360	89	69	66	210	629	389	781	80	282
6	596	520	300	88	69	90	250	596	376	836	75	279
7	969	520	270	87	68	150	280	557	351	839	68	255
8	1210	500	240	86	68	210	316	529	324	829	65	242
9	1300	470	220	85	68	230	340	492	297	786	58	232
10	1470	450	200	84	68	220	364	453	285	723	108	253
11	1570	420	190	83	67	210	390	421	285	640	93	251
12	1580	400	180	82	67	190	350	390	279	556	81	253
13	1570	380	170	81	67	180	330	396	272	481	83	241
14	1530	370	160	80	67	170	290	394	272	405	80	225
15	1450	360	155	79	66	160	249	388	291	347	71	212
16	1300	350	150	78	66	150	265	378	302	301	65	215
17	1200	350	145	77	66	140	250	374	314	272	62	212
18	1050	350	140	76	66	130	221	359	318	252	58	205
19	928	500	135	76	66	120	205	345	313	236	56	195
20	850	750	130	75	66	110	212	345	300	213	52	182
21	780	900	125	75	65	100	255	353	283	240	50	171
22	720	920	120	74	65	90	317	359	268	210	48	162
23	650	940	115	74	65	85	399	362	243	186	44	157
24	580	960	110	74	65	80	481	359	226	163	238	155
25	550	940	107	73	65	76	567	353	209	146	321	147
26	520	850	104	73	65	74	675	338	203	132	542	142
27	480	750	102	72	65	72	767	320	180	119	606	142
28	460	600	100	72	65	71	828	324	157	107	607	136
29	440	500	98	72	---	71	860	352	141	100	635	139
30	420	435	96	71	---	72	858	379	167	94	567	177
31	410	---	94	71	---	75	---	399	---	95	476	---
TOTAL	26517	16755	5936	2473	1873	3652	11014	13945	8532	11507	5640	6596
MEAN	855	559	191	79.8	66.9	118	367	450	284	371	182	220
MAX	1580	960	420	93	70	230	860	834	389	839	635	390
MIN	278	350	94	71	65	65	85	320	141	94	44	136
†	+2.46	+7.59	+7.63	+8.89	+5.56	+7.19	+57.2	+28.5	+23.4	+12.3	+30.4	+23.9
MEAN ‡	858	566	199	88.7	72.5	125	424	478	308	383	212	244
CFSM ‡	2.96	1.95	.69	.31	.25	.43	1.46	1.65	1.06	1.32	.73	.84
IN. ‡	3.41	2.18	.79	.35	.26	.50	1.63	1.90	1.18	1.52	.84	.94

CAL YR 1982 TOTAL 135102 MEAN 370 MAX 1580 MIN 28 MEAN ‡ 386 CFSM ‡ 1.33 IN. ‡ 18.08
WTR YR 1983 TOTAL 114440 MEAN 314 MAX 1580 MIN 44 MEAN ‡ 331 CFSM ‡ 1.14 IN. ‡ 15.52

† Change in contents in Partridge Reservoir and diversion to iron-ore processing plant, equivalent in cubic feet per second; furnished by Erie Mining Co.
‡ Adjusted for change in contents and diversion.

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04018750 ST. LOUIS RIVER AT FORBES, MN

LOCATION.--Lat 47° 21'48", long 92°35'56", in NE¼SE¼ sec.3, T.56 N., R.18 W., St. Louis County, Hydrologic Unit 04010201, on right bank at downstream side of highway bridge, 0.5 mi (0.8 km) downstream from Eveleth Taconite Company dam, 0.6 mi (1.0 km) south of Forbes, 1.8 mi (2.9 km) upstream from Elbow Creek.

DRAINAGE AREA.--713 mi^2 (1,847 km^2).

PERIOD OF RECORD.--August 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,293.11 ft (394.140 m) National Geodetic Vertical Datum of 1929. Prior to Oct. 28, 1964, nonrecording gage at same site and datum.

REMARKS.--Records good except those for winter periods, which are poor. Natural flow of stream affected by contin ually changing iron-mining activities that include diversions for iron-ore processing, regulation of storage reservoirs and tailing ponds, and mine pit dewatering. There is some regulation at medium and low flows by Eveleth Taconite Company dam 1.5 mi (2.4 km) upstream.

AVERAGE DISCHARGE.--19 years, 554 ft^3/s (15.69 m^3/s), 10.55 in/yr (268 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,200 ft^3/s (176 m^3/s) Apr. 25, 1979, gage height, 17.71 ft (5.398 m); minimum daily, 15 ft^3/s (0.42 m^3/s) Jan. 9, 1981; minimum gage height, 5.14 ft (1.567 m) Nov. 26, 1972.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,930 ft^3/s (83.0 m^3/s) Oct. 14, gage height, 12.64 ft (3.853 m); minimum daily discharge, 55 ft^3/s (1.56 m^3/s) Feb. 1; minimum gage height, 5.22 ft (1.591 m) Sept. 29.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	511	823	1000	160	55	190	240	1540	783	425	300	1150
2	577	793	950	250	170	130	280	1510	744	414	282	996
3	806	889	840	180	210	190	350	1450	808	1090	279	864
4	905	1020	820	140	190	190	400	1380	986	1530	277	760
5	906	1060	760	190	140	160	500	1300	955	1610	263	711
6	1170	1060	650	170	170	300	600	1230	914	1590	257	707
7	1850	1040	560	140	190	500	700	1160	835	1630	246	673
8	2080	1020	500	210	200	550	800	1090	758	1690	171	605
9	2200	1090	470	120	150	510	900	989	698	1700	203	573
10	2430	950	450	210	200	480	943	866	643	1610	584	587
11	2640	944	430	180	150	460	958	881	659	1480	764	635
12	2750	940	410	120	220	430	996	829	632	1320	556	609
13	2830	773	390	240	180	410	961	888	600	1150	451	584
14	2840	800	370	130	170	390	926	904	575	1000	425	549
15	2810	770	360	200	200	360	809	845	601	864	380	531
16	2710	750	250	190	210	340	843	796	622	752	338	620
17	2550	728	350	170	130	320	799	758	577	654	308	587
18	2360	732	300	140	200	310	748	734	544	580	294	542
19	2150	802	300	230	200	270	696	776	548	535	288	504
20	1940	1310	270	150	190	240	692	619	538	494	274	494
21	1760	1700	250	140	180	220	727	713	520	521	260	480
22	1600	1750	200	200	170	200	802	716	503	538	246	451
23	1480	1800	240	170	200	230	889	720	473	477	233	419
24	1360	1750	270	150	140	200	995	702	443	432	460	396
25	1210	1700	230	160	210	170	1100	689	419	359	928	384
26	1140	1600	200	170	180	200	1150	664	391	353	1310	441
27	1050	1500	190	190	140	200	1360	629	370	332	1490	356
28	973	1400	230	130	200	180	1450	617	341	308	1420	353
29	933	1300	250	180	---	160	1510	673	314	252	1400	288
30	904	1210	190	320	---	200	1540	722	342	260	1410	454
31	860	---	150	130	---	200	---	779	---	308	1300	---
TOTAL	52285	34004	12830	5460	4945	8890	25664	28169	18136	26258	17397	17303
MEAN	1687	1133	414	176	177	287	855	909	605	847	561	577
MAX	2840	1800	1000	320	220	550	1540	1540	986	1700	1490	1150
MIN	511	728	150	120	55	130	240	617	314	252	171	288
CFSM	2.37	1.59	.58	.25	.25	.40	1.20	1.28	.85	1.19	.79	.81
IN.	2.73	1.77	.67	.28	.26	.46	1.34	1.47	.95	1.37	.91	.90
AC-FT	103700	67450	25450	10830	9810	17630	50900	55870	35970	52080	34510	34320

CAL YR 1982 TOTAL 281801 MEAN 772 MAX 3000 MIN 30 CFSM 1.08 IN 14.70 AC-FT 559000
WTR YR 1983 TOTAL 251341 MEAN 689 MAX 2840 MIN 55 CFSM .97 IN 13.11 AC-FT 498500

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04021530 STONEY BROOK AT BROOKSTON, MN

LOCATION.--Lat 46°51'42", long 92°36'17", in NW¼SE¼ sec.34, T.51 N., R.18 W., St. Louis County, Hydrologic Unit 04010201, on Fond Du Lac Indian Reservation, on left bank 80 ft (24 m) upstream from bridge on County Highway 31, 0.8 mi (1.3 km) upstream from mouth and 0.4 mi (0.6 km) south of Brookston.

DRAINAGE AREA.--97.3 mi^2 (252 km^2).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1970-71, 1973-77, July to September 1983.

GAGE.--Water-stage recorder. Altitude of gage is 1,228 ft (374 m), from topographic map.

REMARKS.--Records good.

EXTREMES FOR CURRENT PERIOD.--July to September 1983: Maximum discharge during period, 129 ft^3/s (3.65 m^3/s) Aug. 10, 11, gage height, 2.41 ft (0.735 m); minimum, 16 ft^3/s (0.45 m^3/s) Sept. 14, 15, gage height, 1.57 ft (0.479 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1									---	---	20	19
2									---	---	19	19
3									---	---	72	19
4									---	---	88	17
5									---	---	79	22
6									---	---	66	28
7									---	†122	54	24
8									---	---	45	22
9									---	---	40	20
10									---	---	88	22
11									---	---	127	20
12									---	---	104	19
13									---	---	81	17
14									---	---	66	16
15									---	---	59	19
16									---	---	62	29
17									---	---	50	30
18									---	---	46	31
19									---	---	44	26
20									---	---	41	24
21									---	---	39	24
22									†45	---	36	24
23									---	---	32	29
24									---	---	30	35
25									---	---	29	31
26									---	24	26	31
27									---	23	25	30
28									---	25	23	29
29									---	24	22	40
30									---	22	21	72
31									---	21	20	---
TOTAL									---	---	1554	788
MEAN									---	---	50.1	26.3
MAX									---	---	127	72
MIN									---	---	19	16
CFSM									---	---	.52	.27
IN.									---	---	.59	.30
AC-FT									---	---	3080	1560

† Result of discharge measurement.

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04021530 STONEY BROOK AT BROOKSTON, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--August to September 1983.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
AUG 03...	0900	80	24.0	174	192	6.1	8.2	82	640

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 03...	26	9.2	3.4	.70	95	11	2.4	12	12

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
AUG 03...	.220	.060	.80	.80	.090	.070	33	.60

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04023150 SIMIAN CREEK NEAR BROOKSTON, MN

LOCATION.--Lat 46°48'17", long 92°30'47", in SE¼NE¼ sec.20, T.50 N., R.17 W., St. Louis County, Hydrologic Unit 04010201, on Fond Du Lac Indian Reservation, on right bank 10 ft (3 m) upstream from bridge on county road, 2.2 mi (3.5 km) upstream from mouth and 6.1 mi (9.8 km) southeast of Brookston.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July to September 1983.

GAGE.--Water-stage recorder. Altitude of gage is 1,238 ft (377 m), from topographic map.

REMARKS.--Records fair.

EXTREMES FOR CURRENT PERIOD.--July to September 1983: Maximum discharge during period, 38 ft^3/s (1.08 m^3/s) Sept. 29, gage height, 2.07 ft (0.631 m); minimum, 0.75 ft^3/s (0.021 m^3/s) July 27, Sept. 29; minimum gage height, 0.59 ft (0.180 m) Aug. 2.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1										---	1.3	1.0
2										---	1.3	1.1
3										---	4.8	1.1
4										---	4.5	1.0
5										---	4.5	1.1
6										---	3.6	1.1
7										---	2.9	1.0
8										8.8	2.2	.88
9										9.0	1.8	.88
10										7.9	14	1.6
11										5.7	26	1.5
12										3.9	18	1.4
13										3.5	12	1.4
14										3.2	8.6	1.4
15										3.1	6.1	2.2
16										3.6	4.8	5.7
17										4.4	4.5	5.5
18										5.9	3.9	4.1
19										5.4	3.8	3.1
20										5.0	3.2	2.5
21										4.5	2.6	2.3
22										3.4	2.4	2.3
23										2.4	1.9	2.1
24										1.7	1.4	1.9
25										1.3	1.2	1.9
26										.94	1.3	1.6
27										.82	1.2	3.8
28										1.2	1.1	2.9
29										1.1	1.1	14
30										1.2	1.4	35
31										1.3	1.1	---
TOTAL										---	148.5	107.36
MEAN										---	4.79	3.58
MAX										---	26	35
MIN										---	1.1	.88
AC-FT										---	295	213

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04023150 SIMIAN CREEK NEAR BROOKSTON, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--August to September 1983.

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
AUG 03...	1600	4.2	23.0	135	139	6.6	5.7	K20	180

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 03...	20	6.4	2.5	.50	71	11	1.7	6.8	8

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
AUG 03...	<.100	.030	.80	.60	.060	.050	23	.50

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04023600 SQUAW CREEK NEAR CLOQUET, MN

LOCATION.--lat 46°44'55", long 92°29'43", in NE¼NE¼ sec.9, t.49 N., R.17 W., Carlton County, Hydrologic Unit 04010201, on Fond Du Lac Indian Reservation, on right bank 10 ft (3 m) upstream from culvert on Reservation Road, 0.3 mi (0.5 km) upstream from mouth and 2.5 mi (4.0 km) from the junction of State Highways 33 and 45 in Cloquet.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July to September 1983.

GAGE.--Water-stage recorder. Altitude of gage is 1,205 ft (367 m), from topographic map.

REMARKS.--Records fair.

EXTREMES FOR CURRENT PERIOD.--July to September 1983: Maximum discharge during period, 48 ft^3/s (1.36 m^3/s) Aug. 23, gage height, 8.04 ft (2.451 m); minimum, 0.26 ft^3/s (0.007 m^3/s) Sept. 1, 8; minimum gage height, 6.69 ft (2.039 m) Sept. 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1										---	1.0	.39
2										---	.97	.42
3										---	18	.47
4										---	16	.52
5										---	6.4	.58
6										---	3.8	.70
7										---	2.0	.58
8										---	1.2	.38
9										---	.70	.52
10										---	20	1.1
11										---	25	.76
12										---	12	.70
13										---	5.9	.64
14										---	3.8	.64
15										---	2.3	1.5
16										---	2.3	6.6
17										---	2.7	3.6
18										---	2.5	2.0
19										2.2	2.3	1.1
20										2.4	2.3	.83
21										1.4	1.9	.83
22										.97	1.7	.83
23										.90	23	.83
24										.83	6.8	.90
25										.83	2.5	.52
26										.76	1.2	.58
27										.83	.90	1.9
28										.76	.76	.90
29										.83	.58	7.1
30										1.0	.58	17
31										1.1	.58	---
TOTAL										---	171.67	55.42
MEAN										---	5.54	1.85
MAX										---	25	17
MIN										---	.58	.38
AC-FT										---	341	110

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04023600 SQUAW CREEK NEAR CLOQUET, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--August to September 1983.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
AUG									
03...	1400	20	21.0	135	139	6.6	7.2	27	370

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG									
03...	18	6.0	3.2	.60	64	14	4.0	15	18

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
AUG								
03...	<.100	.030	1.2	.80	.090	.040	32	.90

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN

LOCATION.--Lat 46°42'12", long 92°25'07", in NW¼ sec.30, T.49 N., R.16 W., Carlton County, Hydrologic Unit 04010201, on right bank 25 ft (8 m) downstream from lower bridge on U.S. Highway 61 at Scanlon, 0.6 mi (1.0 km) downstream from Minnesota Power and Light Co. powerplant, 3 mi (5 km) upstream from Thomson Reservoir, and 3.2 mi (5.1 km) upstream from Midway River.

DRAINAGE AREA.--3,430 mi^2 (8,880 km^2), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--January 1908 to current year. Monthly discharge only for some periods published in WSP 1307. Published as "near Thomson" 1908-50.

REVISED RECORDS.--WSP 1337: 1911-12.

GAGE.--Water-stage recorder. Datum of gage is 1,101.23 ft (335.655 m) National Geodetic Vertical Datum of 1929. Oct. 5, 1909, to Sept. 5, 1914, nonrecording gage 3 mi (5 km) downstream and 50 ft (15 m) below powerplant at datum about 420 ft (128 m) lower. Sept. 6, 1914, to Aug. 4, 1953, powerplant record at Thomson hydroelectric plant.

REMARKS.--Records good except those for the winter period and those for period of no gage-height record, Oct. 11 to Nov. 21, which are fair. Diurnal fluctuation caused by powerplant upstream. Flow regulated by Whiteface Reservoir and Boulder, Island, Rice and Fish Lakes, combined capacity, 332,160 acre-ft (410 hm3); the water-discharge table shows the monthly change in contents (†).

AVERAGE DISCHARGE (UNADJUSTED).--75 years, 2,313 ft^3/s (65.50 m^3/s), 9.16 in/yr (233 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 37,900 ft^3/s (1,070 m^3/s) May 9, 1950; maximum gage height, 15.8 ft (4.816 m) May 9, 1950, from Minnesota Department of Transportation (discharge uncertain); minimum discharge, 54 ft^3/s (1.53 m^3/s) July 30, 1980; minimum daily, 88 ft^3/s (2.49 m^3/s) Aug. 24, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, about 14,500 ft^3/s (411 m^3/s) Oct. 12, from correlation with nearby stations; minimum daily, 758 ft^3/s (21.5 m^3/s) Aug. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1530	3300	3900	2000	1800	1900	2560	5360	3390	1520	758	3280
2	1800	3500	3800	2100	1700	1800	2940	5060	3190	1810	803	2990
3	2660	4000	4200	1700	1500	1950	4190	4760	3140	2370	1400	2680
4	3760	3700	3900	2100	1100	1800	4830	4450	3370	8150	2640	2220
5	3800	3900	3400	2050	1500	2250	5130	4130	4180	10500	2470	1970
6	5820	3800	2900	2250	1700	2760	5520	3900	4410	9500	2180	1800
7	11700	3600	2340	2250	1500	4910	5040	3560	3840	8500	2020	1770
8	13000	3400	2100	2200	1700	6770	4840	3450	3340	8050	1640	1700
9	12900	3300	2000	2100	2000	5380	5370	3100	2890	7810	1550	1670
10	13100	3300	2050	2300	1800	4100	5250	2890	2470	7270	1500	1830
11	14000	3400	1950	2100	1700	3320	5320	2700	2300	6340	2800	1840
12	14300	3700	2100	1800	1750	2990	5910	2430	2470	5100	3940	1980
13	14200	3000	2100	1600	1700	2680	5690	2890	2440	3880	3340	2250
14	13500	2600	2700	2100	1900	2520	5150	3360	2360	2990	2640	1980
15	12500	2600	2600	1700	1750	2410	4450	3330	2560	2710	2230	1800
16	11000	3000	2200	1400	1700	2090	4150	3010	3020	2230	1980	2060
17	10000	3100	2300	1800	1700	1910	4300	2880	3250	2280	1740	2250
18	9000	3000	2250	1500	1750	2130	4040	2520	3110	1880	1590	2870
19	8000	4000	2000	1200	1800	2070	3740	2380	2610	1850	1400	2400
20	7000	6500	2300	2300	1800	2140	4000	2560	2340	1690	1210	2370
21	6200	10000	2000	2000	1800	2150	4680	2660	2200	1550	1120	1970
22	5600	8500	2200	2100	1750	2020	5290	2790	2090	1520	1120	1700
23	5000	7500	2300	2200	1700	2080	5600	2980	2090	1730	950	1840
24	4500	7000	2400	2200	1800	1990	5710	3230	1750	1740	785	1620
25	4000	6500	2200	1500	1750	1850	5780	3140	1640	1460	870	1880
26	3600	6000	1950	1100	1800	1950	5810	2870	1610	1490	1970	1700
27	3300	5400	2150	1400	1900	2060	5960	2570	1470	1310	2850	1740
28	3200	4700	2000	2000	1800	1890	6130	2250	1420	1250	3260	1670
29	3100	4300	1150	2200	---	1890	5990	2590	1340	1300	3230	2080
30	3200	4200	1600	1800	---	2010	5730	2870	1310	1180	3160	2200
31	3200	---	2000	2000	---	2000	---	3210	---	1000	3350	---
TOTAL	228470	134800	75040	59050	48150	79770	149100	99880	77600	111960	62496	62110
MEAN	7370	4493	2421	1905	1720	2573	4970	3222	2587	3612	2016	2070
MAX	14300	10000	4200	2300	2000	6770	6130	5360	4410	10500	3940	3280
MIN	1530	2600	1150	1100	1100	1800	2560	2250	1310	1000	758	1620
†	+165	-104	-781	-1253	-1018	-170	+1614	+1284	+2	+27	+269	-881
MEAN ‡	7535	4389	1640	652	702	2403	6584	4506	2589	3639	2285	1189
CFSM ‡	2.20	1.28	.48	.19	.20	.70	1.92	1.31	.75	1.06	.67	.35
IN. ‡	2.53	1.43	.55	.22	.21	.81	2.14	1.51	.84	1.22	.77	.39

CAL YR 1982 TOTAL 1414580 MEAN 3876 MAX 24500 MIN 794 MEAN ‡ 3933 CFSM ‡ 1.15 IN. ‡ 15.57
WTR YR 1983 TOTAL 1188426 MEAN 3256 MAX 14300 MIN 758 MEAN ‡ 3191 CFSM ‡ .93 IN. ‡ 12.6

† Change in contents, equivalent in cubic feet per second, in Whiteface Reservoir and Boulder, Island, Rice, and Fish Lakes; records furnished by Minnesota Power and Light Co.
‡ Adjusted for change in contents.

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

LOCATION.--Samples collected at cableway 0.75 mi (1.21 km) downstream from gage.

PERIOD OF RECORD.--Water years 1958-66, 1968 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1980 to September 1983 (discontinued).
WATER TEMPERATURES: October 1980 to September 1983 (discontinued).

INSTRUMENTATION.--Water-quality minimonitor since October 1980.

REMARKS.--Letter K indicates non-ideal colony count. Extremes are published for years with 80 percent or more record.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1980-81, 1983): Maximum, 336 micromhos Aug. 14, 1981; minimum, 68 micromhos June 10, 1981.
WATER TEMPERATURES: Maximum, 26.5°C July 15-17, 1983; minimum, 0.0°C several days during winter period.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 206 micromhos Aug. 28; minimum, 110 June 4-5, July 5.
WATER TEMPERATURES: Maximum, 26.5°C July 15-17; minimum, 0.0°C several days during winter period.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
04...	1420	3920	183	164	8.0	7.6	20.0	12.5	3.5	740	10.2
DEC											
07...	1045	2340	120	117	7.3	7.3	-18.0	1.0	2.0	745	12.5
JAN											
31...	1515	2200	140	121	6.9	7.0	-5.0	.0	2.6	736	12.1
MAR											
28...	1330	1900	160	147	7.5	7.5	4.0	.5	2.9	739	12.7
MAY											
23...	1345	2960	150	147	8.2	7.2	17.0	13.0	2.9	732	10.8
JUL											
18...	1415	1790	130	147	7.6	7.5	22.0	25.0	4.4	735	6.8

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
OCT											
04...	99	130	130	15	8.7	4.9	1.0	63	13	4.7	.10
DEC											
07...	90	52	270	12	6.1	4.2	.80	43	16	3.3	<.10
JAN											
31...	86	K18	140	14	6.5	4.1	.80	50	15	3.5	<.10
MAR											
28...	91	K10	--	15	7.3	4.5	1.1	56	15	4.1	.10
MAY											
23...	107	K18	220	15	7.5	4.0	1.3	53	23	.80	.10
JUL											
18...	86	37	110	15	7.2	3.7	1.3	53	22	3.7	.20

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P) (00671)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 04...	9.1	138	.110	.020	.70	.030	.020	<.010	9	95	91
DEC 07...	10	120	.240	.050	.70	.040	.030	.020	--	--	--
JAN 31...	10	106	.360	.120	.20	.020	.010	<.010	4	24	78
MAR 28...	12	109	.350	.100	.50	.030	.020	.020	3	15	94
MAY 23...	4.9	110	.120	.080	.70	.020	.010	<.010	6	48	96
JUL 18...	8.0	136	.150	.070	.90	.080	.080	.040	8	39	97

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA) (01007)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD) (01027)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOVERABLE (UG/L AS CO) (01037)
OCT 04...	1420	--	2	2	100	23	--	2	<1	20	10	<1
MAR 28...	1330	50	--	2	--	18	<1	--	<1	--	10	--
MAY 23...	1345	10	--	1	--	21	<0	--	<1	--	<1	--
JUL 18...	1415	110	--	2	--	20	<0	--	<1	--	<1	--

DATE	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOVERABLE (UG/L AS CU) (01042)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOVERABLE (UG/L AS FE) (01045)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOVERABLE (UG/L AS PB) (01051)	LEAD, DISSOLVED (UG/L AS PB) (01049)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN) (01055)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOVERABLE (UG/L AS HG) (71900)	MERCURY DISSOLVED (UG/L AS HG) (71890)
OCT 04...	<1	6	3	1300	730	150	<1	--	80	33	1.6	.3
MAR 28...	4	--	2	--	750	--	2	<4	--	54	--	<.1
MAY 23...	<3	--	1	--	520	--	<1	<4	--	34	--	--
JUL 18...	<3	--	2	--	970	--	8	<4	--	30	--	1.9

DATE	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI) (01067)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, TOTAL (UG/L AS SE) (01147)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOVERABLE (UG/L AS AG) (01077)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN) (01092)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT 04...	--	4	1	<1	<1	<1	<1	--	--	20	<4
MAR 28...	<10	--	3	--	<1	--	<1	42	<6	--	6
MAY 23...	<10	--	<1	--	<1	--	<1	44	<6	--	<3
JUL 18...	<10	--	6	--	<1	--	<1	47	<6	--	3

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	161	153	155	161	155	158	142	136	139	143	136	139
2	172	161	165	157	153	156	145	142	144	147	142	144
3	174	158	170	174	153	156	144	140	142	151	147	148
4	185	180	182	177	153	157	146	141	143	149	141	144
5	182	171	176	153	150	151	143	139	141	145	143	144
6	176	141	161	153	149	150	142	135	139	145	142	143
7	151	137	140	153	149	151	142	137	139	143	142	142
8	139	135	137	152	148	150	140	137	138	157	141	146
9	137	132	136	153	149	151	141	137	140	143	142	142
10	132	128	130	162	152	155	143	139	141	143	141	142
11	131	129	129	157	153	154	143	140	142	143	140	142
12	131	128	130	164	151	154	146	143	144	143	142	143
13	132	128	130	156	153	155	148	145	146	144	142	143
14	140	131	137	157	155	156	149	146	148	142	137	139
15	140	136	138	155	150	153	150	148	149	143	139	141
16	139	136	137	158	150	153	151	150	151	144	142	143
17	142	138	140	153	150	152	151	148	150	144	137	140
18	141	138	139	155	150	152	150	147	148	140	137	138
19	147	140	142	167	154	160	148	142	146	142	140	141
20	144	141	142	163	146	153	147	142	144	142	129	134
21	148	142	144	146	139	142	149	144	147	144	134	140
22	148	145	146	139	130	135	144	140	142	146	145	145
23	147	145	146	129	123	126	147	140	144	146	144	145
24	150	145	147	127	125	126	149	146	147	148	146	147
25	155	148	150	128	125	126	147	144	146	150	147	148
26	158	152	154	128	125	126	153	145	148	151	149	150
27	162	156	158	131	126	128	152	146	148	152	143	149
28	162	158	160	137	130	133	145	141	143	144	131	136
29	165	159	162	131	128	130	149	144	147	151	131	141
30	164	161	162	136	130	133	150	137	142	146	142	144
31	163	160	161	---	---	---	139	133	137	147	142	144
MONTH	185	128	149	177	123	146	153	133	144	157	129	143

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	146	144	145	151	147	149	184	171	177	134	132	133
2	145	140	144	149	147	148	186	176	181	137	133	135
3	147	139	143	152	147	149	184	172	175	141	136	139
4	148	146	147	152	149	150	172	154	165	146	138	141
5	148	132	144	153	149	151	153	141	147	145	142	143
6	133	128	131	182	152	166	140	130	135	148	145	147
7	140	133	136	189	169	178	130	126	128	150	146	148
8	141	137	139	172	155	163	129	124	127	152	148	149
9	144	138	141	166	148	157	129	125	127	155	152	153
10	150	145	148	186	163	173	130	126	128	156	152	155
11	148	143	144	185	165	175	131	129	130	161	155	157
12	149	145	147	185	164	175	131	126	128	167	162	163
13	150	148	150	181	163	172	128	125	127	166	160	164
14	152	150	151	180	166	172	131	125	128	165	158	162
15	154	151	152	191	179	184	135	129	132	168	163	166
16	152	150	151	183	176	179	135	131	133	168	164	166
17	152	150	151	181	178	180	137	132	134	166	161	163
18	153	149	151	185	181	183	139	135	137	169	164	166
19	150	148	149	200	179	184	149	137	141	169	165	167
20	147	145	146	196	174	181	150	143	146	167	165	166
21	146	144	145	176	169	173	149	142	144	168	163	166
22	146	143	144	172	166	169	146	135	140	171	166	168
23	145	143	144	170	165	168	136	130	132	171	132	155
24	150	142	145	168	163	166	132	129	130	138	126	132
25	148	145	146	166	162	164	131	127	129	130	121	126
26	150	145	148	165	161	163	132	128	130	125	115	120
27	146	145	145	164	162	163	131	128	129	122	117	119
28	153	146	148	164	158	161	132	129	130	124	116	120
29	---	---	---	167	162	164	133	130	131	127	119	122
30	---	---	---	164	163	164	134	131	132	129	121	124
31	---	---	---	170	164	166	---	---	---	132	120	124
MONTH	154	128	146	200	147	167	186	124	138	171	115	147

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	130	122	126	133	125	129	145	142	143	130	127	128
2	129	118	124	137	128	132	149	144	146	133	129	131
3	127	114	121	135	123	132	150	143	147	137	133	135
4	125	110	116	155	124	141	164	151	159	137	133	135
5	119	110	114	140	110	117	189	164	179	136	134	135
6	121	113	117	117	112	115	184	151	168	139	135	137
7	128	115	119	141	112	129	149	129	136	143	139	141
8	125	117	121	120	112	116	130	128	128	149	143	146
9	127	117	120	126	118	122	131	128	129	151	148	149
10	131	121	125	125	120	121	134	127	131	151	147	149
11	134	127	129	127	121	124	139	130	133	154	149	151
12	136	129	133	136	122	129	154	140	147	---	---	---
13	137	131	133	139	132	136	158	144	150	---	---	---
14	136	132	134	144	136	140	162	160	161	---	---	---
15	135	131	133	152	144	148	161	142	150	---	---	---
16	137	133	134	149	146	147	141	129	134	---	---	---
17	134	126	131	144	135	141	135	129	131	---	---	---
18	134	126	130	134	129	132	133	130	133	---	---	---
19	133	128	131	154	133	137	137	133	135	---	---	---
20	133	130	131	140	135	138	142	136	139	---	---	---
21	131	129	130	141	137	139	145	141	143	---	---	---
22	132	125	129	142	140	141	150	145	148	---	---	---
23	129	125	126	145	141	143	160	151	155	---	---	---
24	128	124	125	150	143	146	161	153	156	---	---	---
25	130	122	124	155	149	151	162	154	158	---	---	---
26	127	123	125	155	154	155	175	157	164	---	---	---
27	128	122	125	154	152	153	179	168	173	---	---	---
28	127	123	125	153	150	152	206	179	193	---	---	---
29	125	122	123	154	152	153	176	140	153	---	---	---
30	129	124	126	152	147	150	145	133	141	---	---	---
31	---	---	---	147	143	145	133	128	131	---	---	---
MONTH	137	110	126	155	110	137	206	127	148	---	---	---

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	13.5	13.0	13.0	6.5	6.0	6.0	.0	.0	.0	.0	.0	.0
2	13.0	12.0	12.5	6.5	5.5	6.0	.0	.0	.0	.0	.0	.0
3	12.0	11.0	12.0	6.0	4.5	5.0	.0	.0	.0	.0	.0	.0
4	12.0	11.5	12.0	4.0	2.5	3.0	.0	.0	.0	.0	.0	.0
5	12.0	11.5	12.0	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0
6	11.5	10.0	11.0	2.0	1.5	1.5	.0	.0	.0	.0	.0	.0
7	10.5	9.5	10.0	2.0	1.5	2.0	.0	.0	.0	.0	.0	.0
8	9.5	9.5	9.5	2.0	1.5	2.0	.0	.0	.0	.0	.0	.0
9	9.5	9.5	9.5	2.0	1.5	2.0	.0	.0	.0	.0	.0	.0
10	9.5	9.5	9.5	2.0	1.5	1.5	.0	.0	.0	.0	.0	.0
11	9.5	9.5	9.5	1.5	1.5	1.5	.0	.0	.0	.0	.0	.0
12	10.0	9.5	9.5	1.5	.0	.5	.0	.0	.0	.0	.0	.0
13	10.0	9.5	9.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	10.0	9.5	9.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	10.0	9.0	9.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	9.0	8.5	9.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	8.5	8.0	8.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	8.5	8.0	8.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	8.0	7.5	8.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	7.5	6.5	7.0	1.0	.0	.5	.0	.0	.0	.0	.0	.0
21	6.5	6.0	6.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
22	6.0	6.0	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	6.0	5.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	6.0	5.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	6.0	5.5	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	6.5	6.0	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	7.0	6.5	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	7.0	6.5	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	7.5	7.0	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	7.5	7.0	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
31	7.0	6.0	6.5	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	13.5	5.5	8.5	6.5	.0	1.0	.0	.0	.0	.0	.0	.0

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024000 ST. LOUIS RIVER AT SCANLON, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	.0	.0	.0	.5	.0	.0	8.0	7.0	7.5
2	.0	.0	.0	.0	.0	.0	1.0	.0	.5	8.5	7.5	8.0
3	.0	.0	.0	.0	.0	.0	1.0	.5	.5	9.5	8.0	8.5
4	.0	.0	.0	.0	.0	.0	1.5	.5	1.0	10.0	9.0	9.5
5	.0	.0	.0	.0	.0	.0	1.0	.5	1.0	10.5	9.5	10.0
6	.0	.0	.0	.0	.0	.0	1.0	.5	.5	10.5	9.5	10.0
7	.0	.0	.0	.0	.0	.0	.5	.0	.5	10.5	9.5	10.0
8	.0	.0	.0	.0	.0	.0	1.0	.5	1.0	11.5	10.0	10.5
9	.0	.0	.0	.5	.0	.0	1.5	.5	1.0	11.5	10.5	11.0
10	.0	.0	.0	.0	.0	.0	.5	.0	.5	12.0	10.5	11.0
11	.0	.0	.0	.0	.0	.0	1.5	.5	1.0	13.0	11.5	12.0
12	.0	.0	.0	.0	.0	.0	1.5	.5	1.0	13.0	12.5	13.0
13	.0	.0	.0	.0	.0	.0	1.0	1.0	1.0	13.0	12.0	12.5
14	.0	.0	.0	.0	.0	.0	1.0	.0	.5	13.0	12.5	12.5
15	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.5	12.0	12.0
16	.0	.0	.0	.0	.0	.0	1.0	.0	.5	12.5	11.0	11.5
17	.0	.0	.0	.0	.0	.0	2.0	1.0	1.5	13.0	11.5	12.0
18	.0	.0	.0	.0	.0	.0	2.0	1.5	2.0	13.5	12.5	13.0
19	.0	.0	.0	.0	.0	.0	2.5	1.5	2.0	13.5	12.5	13.0
20	.0	.0	.0	.0	.0	.0	4.0	2.0	3.0	13.0	12.0	12.5
21	.0	.0	.0	.0	.0	.0	4.5	3.5	4.0	12.5	12.0	12.0
22	.0	.0	.0	.0	.0	.0	5.5	4.5	5.0	13.5	12.5	13.0
23	.0	.0	.0	.0	.0	.0	6.0	5.0	5.5	13.5	12.5	13.0
24	.0	.0	.0	.0	.0	.0	7.0	5.5	6.0	14.0	13.0	13.5
25	.0	.0	.0	.0	.0	.0	8.5	6.5	7.5	14.0	13.0	13.5
26	.0	.0	.0	.0	.0	.0	8.5	8.0	8.0	14.0	13.5	14.0
27	.0	.0	.0	.0	.0	.0	8.5	7.5	8.0	14.0	13.5	13.5
28	.0	.0	.0	.0	.0	.0	8.5	8.0	8.5	13.5	13.0	13.0
29	---	---	---	.0	.0	.0	8.0	7.5	7.5	13.0	12.0	12.5
30	---	---	---	.0	.0	.0	8.0	7.5	7.5	12.0	11.5	12.0
31	---	---	---	.0	.0	.0	---	---	---	13.0	11.5	12.0
MONTH	.0	.0	.0	.5	.0	.0	8.5	.0	3.0	14.0	7.0	11.5

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	14.0	12.5	13.5	20.0	18.5	19.5	24.5	23.5	24.0	23.5	22.5	23.0
2	15.0	13.5	14.5	20.0	19.5	19.5	24.5	23.5	24.0	24.0	22.5	23.5
3	15.5	14.5	15.0	20.5	19.5	20.0	24.0	23.0	23.5	24.0	23.5	24.0
4	15.5	14.5	15.0	20.0	18.5	19.5	24.5	23.5	24.0	24.0	23.0	23.5
5	15.0	14.0	14.5	18.5	17.0	18.0	25.0	24.5	25.0	23.0	22.0	22.5
6	15.5	14.5	15.0	18.5	17.5	18.0	25.5	25.0	25.0	22.0	21.0	21.5
7	16.0	14.5	15.0	19.5	18.5	19.0	26.0	25.0	25.5	21.	20.0	20.5
8	15.5	15.0	15.5	21.0	19.5	20.0	25.5	25.0	25.5	20.5	20.0	20.0
9	15.5	14.5	15.0	21.5	21.0	21.0	25.0	24.5	25.0	21.0	20.0	20.5
10	16.0	15.0	15.5	22.5	21.0	21.5	24.5	22.5	23.5	21.0	20.5	20.5
11	17.5	16.0	17.0	23.0	22.5	22.5	22.5	21.5	22.0	20.5	19.0	20.0
12	18.5	17.5	18.0	23.0	22.5	23.0	22.0	20.5	21.5	---	---	---
13	19.5	18.5	19.0	24.0	23.0	23.5	21.5	21.0	21.5	---	---	---
14	19.5	19.0	19.0	25.5	24.0	24.5	22.5	21.0	22.0	---	---	---
15	19.0	18.5	19.0	26.5	25.5	26.0	22.5	22.0	22.5	---	---	---
16	18.5	17.5	18.0	26.5	26.0	26.5	23.0	22.5	22.5	---	---	---
17	17.5	16.5	17.0	26.5	26.0	26.5	23.0	22.5	22.5	---	---	---
18	18.0	16.5	17.5	26.0	25.5	25.5	23.0	22.0	22.5	---	---	---
19	18.5	17.0	18.0	25.5	24.5	25.0	23.0	22.5	22.5	---	---	---
20	18.5	18.0	18.0	25.0	24.5	25.0	22.5	22.0	22.0	---	---	---
21	18.5	18.0	18.0	25.5	25.0	25.0	22.5	21.5	22.0	---	---	---
22	19.5	18.0	18.5	26.0	24.5	25.0	22.0	21.5	22.0	---	---	---
23	21.0	19.0	20.0	25.5	24.5	25.0	22.5	21.5	22.0	---	---	---
24	22.0	21.0	21.5	25.0	24.5	24.5	22.5	21.5	22.0	---	---	---
25	23.0	22.0	22.5	25.0	24.0	24.5	23.5	22.0	22.5	---	---	---
26	23.5	23.0	23.0	24.5	23.5	24.0	24.0	22.5	23.0	---	---	---
27	23.0	21.5	22.5	24.5	23.5	24.0	25.0	24.0	24.5	---	---	---
28	22.0	20.5	21.5	25.0	23.5	24.0	25.0	24.0	24.5	---	---	---
29	20.5	19.0	20.0	25.5	24.0	24.5	24.0	23.5	23.5	---	---	---
30	19.5	18.0	19.0	25.0	24.0	24.5	23.0	22.5	23.0	---	---	---
31	---	---	---	24.0	23.5	24.0	23.0	22.0	22.5	---	---	---
MONTH	23.5	12.5	18.0	26.5	17.0	23.0	26.0	20.5	23.0	---	---	---

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024015 OTTER CREEK NEAR CLOQUET, MN

LOCATION.--Lat 46°41'38", long 92°30'58", in SE¼SE¼ sec.29, T.49 N., R.17 W., Carlton County, Hydrologic Unit 04010201, on Fond Du Lac Indian Reservation on right bank 10 ft (3 m) upstream of culvert on road in Cloquet Experimental Forest and 3.5 m (5.6 km) from junction of State Highways 33 and 45 in Cloquet.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July to September 1983.

GAGE.--Water-stage recorder. Altitude of gage is 1,228 ft (374 m), from topographic map.

REMARKS.--Records fair.

EXTREMES FOR CURRENT PERIOD.--July to September 1983: Maximum discharge during period, 28 ft^3/s (0.79 m^3/s) Aug. 10, gage height, 6.17 ft (1.881 m); minimum, 0.41 ft^3/s (0.012 m^3/s) Aug. 2, gage height, 5.27 ft (1.606 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1										---	.73	.93
2										---	.73	1.3
3										---	18	1.3
4										---	11	1.3
5										---	6.1	1.3
6										---	4.2	1.3
7										---	3.4	1.3
8										---	2.9	1.6
9										---	2.5	1.4
10										---	19	3.1
11										---	12	2.7
12										---	6.1	2.1
13										---	4.0	1.3
14										---	3.5	1.2
15										---	3.0	2.9
16										---	2.7	12
17										---	2.4	9.3
18										---	2.2	5.7
19										2.9	2.0	3.9
20										2.9	1.8	2.9
21										2.4	1.6	2.7
22										2.0	1.5	2.3
23										1.7	1.4	2.1
24										1.4	1.3	1.6
25										1.2	1.2	1.8
26										1.0	1.2	1.3
27										.93	1.1	1.0
28										.93	1.1	1.0
29										.73	1.0	8.9
30										.56	.95	22
31										.64	.90	---
TOTAL										---	121.51	103.53
MEAN										---	3.92	3.45
MAX										---	19	22
MIN										---	.73	.93
AC-FT										---	241	205

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024015 OTTER CREEK NEAR CLOQUET, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--August to September 1983.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
AUG 02...	1800	23	22.5	122	135	6.3	33	240

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 02...	20	5.7	2.7	.30	66	16	2.3	18	15

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
AUG 02...	<.100	.100	1.0	1.0	.060	.040	30	1.6

BEST COPY AVAILABLE

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024098 DEER CREEK NEAR HOLYOKE, MN

LOCATION.--Lat 46°31'30", long 92°23'20", in NE¼SE¼ sec.29, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, on left bank 179 ft (54.6 m) west of State Highway No. 23, 0.9 mi (1.4 km) upstream from mouth and 4.0 mi (6.4 km) north of Holyoke.

DRAINAGE AREA.--7.77 mi^2 (20.1 km^2).

PERIOD OF RECORD.--October 1976 to current year.

GAGE.--Water-stage recorder. Datum of gage is 786.14 ft (239.615 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for winter periods, which are fair.

AVERAGE DISCHARGE.--7 years, 6.60 ft^3/s (0.187 m^3/s), 11.54 in/yr (293 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,010 ft^3/s (28.6 m^3/s) Nov. 20, 1982, gage height, 21.38 ft (6.517 m), from floodmarks, from rating curve extended above 150 ft^3/s (4.2 m^3/s) on basis of flow through culvert computations; minimum discharge, 0.20 ft^3/s (0.006 m^3/s) Aug. 13, 16, 1982.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,010 ft^3/s (28.6 m^3/s) Nov. 20, 1982, gage height, 21.38 ft (6.517 m), from floodmarks, from rating curve extended above 150 ft^3/s (4.2 m^3/s) on basis of flow through culvert computations; minimum discharge, 1.5 ft^3/s (0.042 m^3/s) Aug. 23, gage height, 11.21 ft (3.417 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.2	2.7	5.6	2.5	2.4	15	28	9.7	5.5	13	2.6	2.3
2	27	2.4	15	2.5	2.4	8.2	30	8.4	4.1	5.1	2.4	1.9
3	27	5.4	15	2.5	2.4	7.6	24	7.3	3.7	131	74	2.0
4	12	5.9	8.5	2.5	2.4	10	25	6.5	3.8	74	10	2.2
5	7.4	4.9	6.2	2.5	2.4	23	30	5.9	3.7	22	4.6	3.9
6	50	4.5	4.6	2.5	2.4	73	23	5.6	3.6	9.8	2.9	3.2
7	52	5.1	3.4	2.5	2.4	75	17	5.2	2.9	5.8	2.3	1.9
8	53	7.1	3.0	2.5	2.4	36	23	4.9	2.3	4.2	2.0	2.0
9	46	5.0	2.8	2.5	2.4	22	27	4.5	2.3	3.2	1.8	1.9
10	54	4.9	2.6	2.5	2.4	16	24	4.6	2.8	2.5	16	34
11	53	8.4	2.6	2.5	2.5	13	40	4.6	3.2	2.4	8.6	9.2
12	53	10	2.5	2.5	2.5	11	33	4.6	2.1	2.4	3.9	8.1
13	49	7.4	2.5	2.5	2.5	13	23	15	2.2	2.4	2.4	6.6
14	32	4.4	2.5	2.5	2.5	16	18	8.9	3.2	2.4	2.3	3.4
15	27	3.9	2.5	2.5	2.6	13	17	6.7	4.7	2.4	2.2	8.3
16	23	3.7	2.5	2.4	2.6	8.7	16	5.7	3.4	2.3	2.0	31
17	20	3.6	2.5	2.4	2.7	7.9	14	4.9	2.9	2.2	2.3	12
18	17	4.1	2.5	2.4	2.8	7.1	13	5.0	2.4	2.2	1.9	6.4
19	14	30	2.5	2.4	2.9	6.2	18	4.8	2.4	2.2	1.8	4.6
20	13	144	2.5	2.4	3.0	6.0	47	5.3	2.3	2.2	1.9	3.7
21	7.7	30	2.5	2.4	3.1	5.7	58	6.3	2.3	2.4	1.9	3.2
22	5.1	13	2.5	2.4	3.3	6.0	52	5.4	2.3	2.4	4.4	2.9
23	5.1	9.5	2.5	2.4	3.5	6.0	39	4.6	2.3	2.3	2.9	2.5
24	5.1	5.9	2.6	2.4	3.7	6.0	31	4.0	2.3	2.3	2.4	2.4
25	4.4	5.4	2.7	2.4	4.0	6.0	25	3.4	2.3	2.3	2.7	2.4
26	3.6	5.6	2.5	2.4	4.1	6.0	20	3.0	2.3	2.3	2.0	2.4
27	2.7	8.9	2.5	2.4	7.8	5.8	16	3.0	2.3	2.3	2.2	2.5
28	2.4	8.1	2.5	2.4	35	6.2	13	3.1	2.2	2.4	3.9	2.3
29	2.9	6.1	2.5	2.4	---	9.6	16	4.8	2.1	3.0	3.4	3.2
30	3.4	4.7	2.5	2.4	---	11	12	7.6	12	2.4	2.7	12
31	2.7	---	2.5	2.4	---	17	---	9.2	---	2.9	1.9	---
TOTAL	676.7	364.6	119.6	75.9	115.1	473.0	772	182.5	95.9	320.7	178.3	184.4
MEAN	21.8	12.2	3.86	2.45	4.11	15.3	25.7	5.89	3.20	10.3	5.75	6.15
MAX	54	144	15	2.5	35	75	58	15	12	131	74	34
MIN	2.2	2.4	2.5	2.4	2.4	5.7	12	3.0	2.1	2.2	1.8	1.9
CFSM	2.81	1.57	.50	.32	.53	1.97	3.31	.76	.41	1.33	.74	.79
IN.	3.24	1.75	.57	.36	.55	2.26	3.70	.87	.46	1.54	.85	.88
AC-FT	1340	723	237	151	228	938	1530	362	190	636	354	366

CAL YR 1982	TOTAL	3626.68	MEAN 9.94	MAX 144	MIN .39	CFSM 1.28	IN 17.36	AC-FT 7190
WTR YR 1983	TOTAL	3558.70	MEAN 9.75	MAX 144	MIN 1.8	CFSM 1.26	IN 17.04	AC-FT 7060

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05045950 ORWELL LAKE NEAR FERGUS FALLS, MN

LOCATION.--Lat 46°12'55", long 96°10'40", in SW¼ sec.26, T.132 N., R.44 W., Otter Tail County, Hydrologic Unit 09020103, at dam on Otter Tail River at outlet of Orwell Lake, 7 mi (11 km) southwest of Fergus Falls.

DRAINAGE AREA.--1,830 mi^2 (4,740 km^2), approximately.

PERIOD OF RECORD.--March 1953 to current year. Prior to October 1971, published as Orwell Reservoir.

GAGE.--Water-stage recorder. Datum of gage is adjustment of 1912.

REMARKS.--Reservoir is formed by earth dam with concrete spillway with one taintor gate; storage began in March 1953. Capacity to elevation 1,070 ft (326 m) (maximum operating stage) is 14,100 acre-ft (17.4 hm^3) of which 13,100 acre-ft (16.2 hm^3) is controlled storage above elevation 1,048 ft (319 m) (minimum operating stage). Dead storage, 210 acre-ft (0.259 hm^3). Figures given herein represent total contents. Reservoir is used for flood control and to increase low flow for water supply and pollution abatement.

COOPERATION.--Records furnished by Corps of Engineers.

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 16,920 acre-ft (20.9 hm^3) June 17, 1962, May 23, 1966, elevation, 1,072.38 ft (326.861 m); minimum (after initial filling), 844 acre-ft (1.04 hm^3) Aug. 26, 27, 1953, elevation, 1,046.96 ft (319.113 m).

EXTREMES FOR CURRENT YEAR.--Maximum contents, 14,720 acre-ft (18.1 hm^3) Oct. 7, elevation, 1,070.54 ft (326.301 m); minimum, 1,360 acre-ft (1.68 hm^3) June 10, elevation, 1,049.66 ft (319.936 m).

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,070.16	14,280	
Oct. 31	1,068.37	12,370	-1,910
Nov. 30	1,063.22	7,980	-4,390
Dec. 31	1,059.85	5,660	-2,320
CAL YR 1982			-1,060
Jan. 31	1,056.04	3,670	-1,990
Feb. 28	1,055.82	3,570	-100
Mar. 31	1,053.73	2,690	-880
Apr. 30	1,053.28	2,510	-180
May 31	1,051.00	1,750	-760
June 30	1,055.40	3,380	+1,630
July 31	1,063.16	7,930	+4,550
Aug. 31	1,066.33	10,500	+2,570
Sept. 30	1,069.15	13,160	+2,660
WTR YR 1983			-1,120

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05046000 OTTER TAIL RIVER BELOW ORWELL DAM, NEAR FERGUS FALLS, MN

LOCATION.--Lat 46°12'35", long 96°11'05", in NE¼ sec.34, T.132 N., R.44 W., Otter Tail County, Hydrologic Unit 09020103, on left bank 0.7 mi (1.1 km) downstream from Orwell Dam, 6.1 mi (9.8 km) downstream from Dayton Hollow Dam, 8 mi (13 km) southwest of Fergus Falls, and 11.1 mi (17.9 km) downstream from Pelican River.

DRAINAGE AREA.--1,830 mi^2 (4,740 km^2), approximately.

PERIOD OF RECORD.--October 1930 to current year. Prior to October 1952, published as Otter Tail River below Pelican River, near Fergus Falls. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 785: 1934(M). WSP 1208: 1947(M). WSP 1308: 1931(M).

GAGE.--Water-stage recorder. Datum of gage is 1,029.65 ft (313.837 m), adjustment of 1912 (levels by Corps of Engineers). Oct. 11, 1930, to Nov. 17, 1933, at same site at datum 2.00 ft (0.61 m) higher; Nov. 18, 1933, to Mar. 21, 1953, at site 6.1 mi (9.8 km) upstream at datum 40.30 ft (12.283 m) higher.

REMARKS.--Records good. Flow regulated by Orwell Lake (station 05045950) beginning Mar. 21, 1953 and powerplants upstream.

AVERAGE DISCHARGE.--53 years, 304 ft^3/s (8.609 m^3/s), 220,200 acre-ft/yr (272 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,710 ft^3/s (48.4 m^3/s) June 17, 1953, gage height, 5.60 ft (1.707 m) backwater from aquatic vegetation; minimum, 0.70 ft^3/s (0.020 m^3/s) Aug. 5, 1970, gage height, 1.28 ft (0.390 m), result of regulation.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 524 ft^3/s (14.8 m^3/s) July 20, gage height, 3.11 ft (0.948 m) result of regulation; minimum, 62 ft^3/s (1.76 m^3/s) July 21, gage height, 2.10 ft (0.640 m) result of regulation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	167	334	289	300	262	294	362	373	273	178	343	397
2	173	334	290	299	262	294	362	388	270	213	345	401
3	177	334	294	296	259	294	360	388	255	244	345	405
4	195	334	294	295	260	294	361	381	254	267	345	401
5	205	334	294	294	256	294	362	350	252	304	345	401
6	235	333	294	294	256	298	362	370	243	339	345	400
7	302	333	294	292	256	342	362	369	218	332	354	401
8	304	333	294	289	256	367	363	368	230	309	354	402
9	283	328	294	289	256	385	363	358	232	320	356	401
10	289	349	294	289	256	396	366	336	236	317	356	406
11	289	363	294	289	256	389	377	315	240	289	357	407
12	321	366	290	286	256	382	385	307	240	261	357	380
13	358	362	289	283	256	379	383	314	243	225	363	367
14	373	362	289	283	256	377	384	319	250	116	365	362
15	341	359	289	283	256	375	383	321	255	88	367	363
16	322	356	289	283	256	373	381	324	268	94	369	364
17	328	354	286	281	256	373	378	328	269	97	370	360
18	328	351	287	277	256	373	383	333	268	98	371	362
19	328	340	284	272	256	372	384	340	265	232	373	327
20	328	334	284	272	261	370	379	336	234	438	373	295
21	328	334	302	273	261	370	378	334	213	440	371	299
22	328	331	317	274	261	368	379	334	219	443	371	294
23	328	328	315	272	261	365	384	314	223	442	375	295
24	328	308	313	272	261	357	384	306	223	436	378	298
25	334	289	313	272	282	357	383	306	224	371	378	295
26	334	289	311	272	294	357	382	302	224	333	378	300
27	333	289	311	269	294	359	377	289	212	336	378	304
28	334	289	311	267	294	358	374	280	196	339	379	307
29	334	289	306	267	---	356	373	278	181	339	379	311
30	332	289	304	267	---	356	372	278	165	339	391	306
31	328	---	300	266	---	358	---	277	---	339	401	---
TOTAL	9287	9928	9215	8717	7352	10982	11226	10216	7075	8918	11332	10611
MEAN	300	331	297	281	263	354	374	330	236	288	366	354
MAX	373	366	317	300	294	396	385	388	273	443	401	407
MIN	167	289	284	266	256	294	360	277	165	88	343	294
CFSM	.16	.18	.16	.15	.14	.19	.20	.18	.13	.16	.20	.19
IN.	.19	.20	.19	.18	.15	.22	.23	.21	.14	.18	.23	.22
AC-FT	18420	19690	18280	17290	14580	21780	22270	20260	14030	17690	22480	21050

CAL YR 1982 TOTAL 148142 MEAN 406 MAX 846 MIN 32 CFSM .22 IN 3.01 AC-FT 293800
WTR YR 1983 TOTAL 114859 MEAN 315 MAX 443 MIN 88 CFSM .17 IN 2.33 AC-FT 227800

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SD

LOCATION.--Lat 45°51'45", long 96°34'25", in SW¼SW¼ sec.27, T.128 N., R.47 W., Roberts County, Hydrologic Unit 09020101, on Sisseton Indian Reservation, on left bank just downstream from Big Slough Outlet, 300 ft (91 m) downstream from White Rock Dam, 4 mi (6 km) south of White Rock, and 5 mi (8 km) northwest of Wheaton, MN.

DRAINAGE AREA.--1,160 mi^2 (3,004 km^2), approximately.

PERIOD OF RECORD.--October 1941 to current year.

GAGE.--Water-stage recorder. Datum of gage is 960.00 ft (292.608 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Jan. 14, 1943, nonrecording gage at same site at datum 0.11 ft (0.03 m) lower. Jan. 15, 1943, to Sept. 30, 1963, water-stage recorder at same site at datum 0.11 ft (0.03 m) lower.

REMARKS.--Records fair. Flow regulated by Lake Traverse-Boise de Sioux Flood Control and Water Conservation project (available capacity for flood control, 137,000 acre-ft or 169 hm^3).

AVERAGE DISCHARGE.--42 years, 75.0 ft^3/s (2.124 m^3/s), 55,340 acre-ft/yr (67.0 hm^3/yr); median of yearly mean discharges, 43 ft^3/s (1.22 m^3/s), 31,200 acre-ft/yr (38 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,770 ft^3/s (107 m^3/s), occurred during period Apr. 19-21, 1969, gage height, 15.07 ft (4.593 m), from floodmark; no flow at times in most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 150 ft^3/s (4.25 m^3/s) Nov. 29, gage height, 6.63 ft (2.021 m) (backwater from ice) due to regulation; no flow on many days.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.02	.00	52	10	.00	.03	3.8	3.2	.49	.32	.00	.00
2	.08	.00	51	11	.00	.06	3.8	4.0	.40	.27	.00	.00
3	.04	.00	50	7.5	.00	.08	3.4	4.2	.44	.27	.00	.00
4	.03	.00	48	4.6	.00	.12	2.8	3.6	.53	.35	.00	.00
5	.14	.00	47	4.4	.00	.14	2.8	2.4	.58	.36	.00	.00
6	.35	.00	45	4.6	.00	.15	2.4	2.8	.54	.28	.00	.00
7	.35	.00	43	4.9	.00	.23	2.1	4.2	.45	.15	.00	.00
8	.33	.00	37	2.1	.00	.25	1.9	1.5	.38	.10	.00	.00
9	.60	.00	35	1.4	.00	.33	1.5	1.8	.34	.08	.00	.00
10	.62	.00	34	3.4	.00	.80	1.4	4.6	.26	.00	.00	.00
11	.55	.00	34	1.5	.00	2.5	1.2	2.5	.19	.00	.00	.00
12	.52	.00	33	.72	.00	2.5	1.3	1.5	.09	.00	.00	.00
13	.48	.00	32	.90	.00	2.1	4.0	1.1	.14	.00	.00	.00
14	.42	.00	30	1.8	.00	5.8	6.3	1.8	.59	.00	.00	.00
15	.42	.00	16	1.6	.00	5.8	2.1	1.5	.71	.00	.00	.00
16	.23	.00	14	.96	.00	5.2	2.2	1.3	.68	.00	.00	.00
17	.14	.00	16	.65	.00	5.2	1.6	3.0	.59	.00	.00	.00
18	.23	.00	19	.50	.00	4.2	1.8	3.6	.45	.00	.00	.00
19	.31	.00	16	.23	.00	4.2	1.6	1.5	.32	.00	.00	.00
20	.23	.00	11	.04	.00	4.0	1.8	1.2	.27	.00	.00	.00
21	.10	.00	8.7	.00	.00	4.0	2.0	.71	.27	.00	.00	.00
22	.08	.00	8.3	.00	.00	3.8	3.4	1.2	.23	.00	.00	.00
23	.08	21	7.2	.00	.00	3.6	3.0	.72	.28	.00	.00	.00
24	.08	56	3.2	.00	.00	3.4	2.4	1.1	.23	.00	.00	.00
25	.08	9.0	1.1	.00	.00	3.4	1.6	.74	.14	.00	.00	.00
26	.00	.20	3.2	.00	.00	3.2	2.4	.45	.14	.00	.00	.00
27	.00	.00	6.0	.00	.00	3.2	2.6	.38	.19	.00	.00	.00
28	.00	.00	5.5	.00	.00	3.2	3.2	.75	.17	.00	.00	.00
29	.00	19	3.6	.00	---	3.0	3.2	1.1	.29	.00	.00	.00
30	.00	64	3.0	.00	---	3.0	2.6	.79	.34	.00	.00	.00
31	.00	---	5.2	.00	---	3.4	---	.64	---	.00	.00	---
TOTAL	6.51	169.20	718.0	62.80	.00	80.89	76.2	59.80	10.72	2.18	.00	.00
MEAN	.21	5.64	23.2	2.03	.000	2.61	2.54	1.93	.36	.070	.000	.000
MAX	.62	64	52	11	.00	5.8	6.3	4.6	.71	.36	.00	.00
MIN	.00	.00	1.1	.00	.00	.03	1.2	.38	.09	.00	.00	.00
CFSM	.000	.005	.02	.002	.000	.002	.002	.002	.000	.000	.000	.000
IN.	.00	.01	.02	.00	.00	.00	.00	.00	.00	.00	.00	.00
AC-FT	13	336	1420	125	.00	160	151	119	21	4.3	.00	.00

CAL YR 1982 TOTAL 10396.25 MEAN 28.5 MAX 346 MIN .00 CFSM .03 IN .33 AC-FT 20620
WTR YR 1983 TOTAL 1186.38 MEAN 3.25 MAX 64 MIN .00 CFSM .003 IN .04 AC-FT 2350

BEST COPY AVAILABLE

05051500 RED RIVER OF THE NORTH AT WAHPETON, ND

LOCATION.--Lat 46°15'55", long 96°35'40", in NE¼ sec.8, T.132 N., R.47 W., Richland County, Hydrologic Unit 09020104, on left bank in Wahpeton, 800 ft (244 m) downstream from confluence of Bois de Sioux and Otter Tail Rivers and at mile 548.6 (882.7 km)

DRAINAGE AREA.--4,010 mi^2 (10,390 km^2), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1942 to current year. Gage-height records collected in this vicinity since 1917 are contained in reports of the U.S. Weather Bureau.

GAGE.--Water-stage recorder and concrete and wooden dam. Datum of gage is 942.97 ft (287.417 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 6, 1943, U.S. Weather Bureau nonrecording gage 800 ft (244 m) upstream, converted to present datum. Aug. 6, 1943, to Oct. 27, 1950, nonrecording gage at present site and datum.

REMARKS.--Records good except those for winter periods, which are fair. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft (17.4 hm^3) at elevation 1,070 ft (326.136 m) National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft (169 hm^3), available for flood control; numerous other controlled lakes and ponds, and several powerplants.

AVERAGE DISCHARGE.--40 years (1943-83), 519 ft^3/s (14.70 m^3/s), 376,000 acre-ft/yr (464 hm^3/yr); median of yearly mean discharges, 459 ft^3/s (13.0 m^3/s), 333,000 acre-ft/yr (411 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,200 ft^3/s (261 m^3/s) Apr. 10, 1969, gage height, 16.34 ft (4.980 m); minimum daily, 1.7 ft^3/s (0.048 m^3/s) Aug. 28 to Sept. 5, 9, 10, 1976.

EXTREMES OUTSIDE PERIOD OF RECORD.--A stage of 17.0 ft (5.182 m), discharge, 10,500 ft^3/s (297 m^3/s) occurred in the spring of 1897 and has not been exceeded since.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 880 ft^3/s (24.9 m^3/s) Mar.13, gage height, 5.70 ft (1.737 m) backwater from ice; minimum daily, 80 ft^3/s (2.27 m^3/s) July 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	165	388	420	390	295	410	476	392	253	135	336	445
2	186	385	452	370	285	440	486	395	247	137	329	445
3	191	391	480	350	280	460	492	401	240	180	335	418
4	186	388	410	350	290	510	486	404	230	209	331	398
5	196	388	370	355	320	580	479	399	216	233	326	395
6	264	381	310	360	300	600	469	369	191	262	328	382
7	273	380	285	350	300	600	458	372	180	298	324	376
8	330	399	250	350	312	260	448	378	182	302	321	369
9	481	408	280	345	328	260	441	371	189	283	328	369
10	516	391	330	330	330	405	434	345	195	272	327	376
11	556	270	350	290	335	645	434	350	228	269	333	372
12	619	255	360	230	340	800	434	332	215	254	329	376
13	644	220	395	300	340	880	438	302	220	214	327	369
14	646	320	390	322	338	800	445	303	245	172	332	341
15	622	430	370	298	332	720	441	308	240	80	330	341
16	565	510	350	315	330	700	424	308	240	134	339	354
17	488	475	350	325	325	564	418	308	250	270	354	344
18	454	455	355	328	320	556	414	308	252	317	349	341
19	438	450	355	325	325	564	414	308	251	338	343	341
20	436	390	345	330	330	568	418	326	248	537	344	326
21	442	255	332	330	320	564	414	316	229	734	342	302
22	475	190	352	338	322	548	411	306	189	733	344	314
23	416	260	370	330	332	536	408	306	186	649	349	290
24	404	325	375	325	335	511	411	292	187	591	348	279
25	400	360	330	292	340	500	411	281	184	560	344	282
26	395	350	285	300	345	493	405	278	195	483	342	282
27	390	320	345	320	370	479	408	268	193	377	345	285
28	389	355	340	330	385	465	405	260	180	350	344	285
29	387	390	255	328	---	458	405	252	167	339	436	288
30	387	400	370	320	---	451	398	255	162	341	563	288
31	387	---	390	315	---	455	---	257	---	333	472	---
TOTAL	12728	10879	10951	10141	9104	16782	13025	10050	6384	10386	10894	10373
MEAN	411	363	353	327	325	541	434	324	213	335	351	346
MAX	646	510	480	390	385	880	492	404	253	734	563	445
MIN	165	190	250	230	280	260	398	252	162	80	321	279
CFSM	.10	.09	.09	.08	.08	.14	.11	.08	.05	.08	.09	.09
IN.	.12	.10	.10	.09	.08	.16	.12	.09	.06	.10	.10	.10
AC-FT	25250	21580	21720	20110	18060	33290	25840	19930	12660	20600	21610	20570

CAL YR 1982 TOTAL 184300 MEAN 505 MAX 3070 MIN 37 AC-FT 365600
WTR YR 1983 TOTAL 131697 MEAN 361 MAX 880 MIN 80 AC-FT 261200

BEST COPY AVAILABLE

05051500 RED RIVER OF THE NORTH AT WAHPETON, ND--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1972 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)
MAR 24...	1205	504	520	8.2	3.0	3.0	43	30	15	6.9	64	9.7
AUG 29...	1330	352	421	7.4	25.5	25.5	36	27	4.5	4.2	16	7.3

DATE	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)
MAR 24...	.10	13	293	2	0	60	1	20	20	.2	1	0
AUG 29...	.10	21	227	5	40	30	2	8	10	.3	1	0

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05051522 RED RIVER OF THE NORTH AT HICKSON, ND

LOCATION.--Lat 46°39'35", long 96°47'44", in SW¼ sec.19, T.137 N., R.48 W., Clay County, MN, Hydrologic Unit 09020104, on right bank 60 ft (18 m) downstream from bridge on township road, and 1 mi (1.6 km) southeast of Hickson, ND.

DRAINAGE AREA.--4,300 mi^2 (11,100 km^2), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1975 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 877.06 ft (267.3 m) National Geodetic Vertical Datum of 1929.

REMARKS.--Records good. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft (17.4 hm^3) at elevation 1,070 ft (326.136 m) National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft (169 hm^3), available for flood control; numerous other controlled lakes and ponds; and several powerplants.

AVERAGE DISCHARGE.--8 years, 479 ft^3/s (13.57 m^3/s), 347,000 acre-ft/yr (428 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,600 ft^3/s (272 m^3/s) Apr. 18, 1979, gage height, 33.03 ft (10.068 m); no flow Oct. 26, 1976, to Jan. 9, 1977.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 824 ft^3/s (23.3 m^3/s) Mar. 19, gage height, 11.08 ft (3.377 m); minimum daily, 169 ft^3/s (4.79 m^3/s) June 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	176	389	417	357	325	367	746	444	268	181	352	536
2	188	388	424	374	317	389	741	444	270	200	340	496
3	198	388	434	376	290	402	733	436	268	584	332	472
4	209	381	458	378	287	408	720	436	260	428	332	464
5	214	380	452	352	262	448	708	452	243	340	336	444
6	228	382	424	356	276	519	595	452	225	308	336	424
7	259	386	328	360	322	675	534	448	209	292	328	416
8	301	387	222	362	334	665	514	424	179	300	320	407
9	356	384	246	358	300	595	495	424	171	304	316	403
10	466	413	302	356	315	395	482	424	169	304	316	399
11	575	423	331	348	330	269	472	423	188	276	320	396
12	609	396	348	337	330	336	464	424	208	264	324	398
13	632	248	361	319	348	513	456	410	228	256	328	400
14	655	205	377	252	340	684	454	373	229	236	332	396
15	659	195	384	293	340	777	460	358	232	200	332	388
16	650	355	380	326	340	790	471	358	250	180	340	372
17	625	518	377	310	337	797	475	364	260	200	332	370
18	560	538	374	326	337	814	472	365	262	420	348	372
19	500	509	369	342	340	822	464	363	279	508	352	362
20	463	491	368	330	337	823	462	359	283	562	352	354
21	443	460	368	330	336	812	466	364	284	602	352	352
22	439	431	363	330	338	802	464	369	277	711	352	332
23	457	301	358	330	337	780	459	353	249	765	348	324
24	458	193	363	330	336	774	454	341	212	715	352	324
25	426	210	374	325	339	770	453	335	202	632	360	310
26	415	300	378	305	346	758	450	318	202	582	356	298
27	405	350	335	290	348	742	447	309	208	544	352	297
28	401	385	299	305	350	727	444	311	211	468	352	299
29	396	405	323	325	---	730	444	293	204	396	356	296
30	393	411	317	341	---	724	448	276	198	380	376	302
31	392	---	291	330	---	731	---	270	---	376	504	---
TOTAL	13148	11202	11145	10353	9137	19838	15447	11720	6928	12514	10728	11403
MEAN	424	373	360	334	326	640	515	378	231	404	346	380
MAX	659	538	458	378	350	823	746	452	284	765	504	536
MIN	176	193	222	252	262	269	444	270	169	180	316	296
AC-FT	26080	22220	22110	20540	18120	39350	30640	23250	13740	24820	21280	22620

CAL YR 1982 TOTAL 212077 MEAN 581 MAX 4150 MIN 51 AC-FT 420700
WTR YR 1983 TOTAL 143563 MEAN 393 MAX 823 MIN 169 AC-FT 284800

BEST COPY AVAILABLE

05051522 RED RIVER OF THE NORTH AT HICKSON, ND--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1976 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)
DEC										
16...	1140	391	560	8.2	-4.0	.0	5	3.7	16.3	114
APR										
14...	0955	444	470	8.6	-3.0	5.0	10	23	14.2	115
SEP										
08...	0950	386	480	8.4	25.0	19.0	5	37	9.0	102

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
DEC									
16	55	41	20	6.6	86	11	.10	14	391
APR									
14...	44	28	13	5.1	44	8.5	.10	8.7	267
SEP									
08...	43	30	15	1.3	38	9.0	.10	21	289

DATE	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
DEC									
16...	<.100	<.100	.070	1.1	1.2	.070	.050	13	.60
APR									
14...	<.100	.100	.140	1.3	1.4	.120	.050	8.7	.50
SEP									
08...	.300	.450	.070	1.3	1.4	.180	.120	8.9	.40

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05054000 RED RIVER OF THE NORTH AT FARGO, ND

LOCATION.--Lat 46°51'40", long 96°47'00", in NW¼NE¼ sec.18, T.139 N., R.48 W., Cass County, Hydrologic Unit 09020104, at city waterplant on 4th St. S. in Fargo, 25 mi (40 km) upstream from mouth of Sheyenne River and at mile 453.0 (728.9 km).
DRAINAGE AREA.--6,800 mi² (17,600 km²), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1901 to current year. Published as "at Moorhead, Minn." 1901. Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WSP 1308: 1902-4, 1906-7, 1910-14, 1916, 1918, 1924. WSP 1388: 1905-6, 1917-20(M), 1935(M), 1938-39(M), 1943.
GAGE.--Water-stage recorder and concrete control. Datum of gage is 861.8 ft (262.68 m) National Geodetic Vertical Datum of 1929. Oct. 1, 1960, to Sept. 30, 1962, water-stage recorder at present site at datum 5.6 ft (1.71 m) higher. See WSP 1728 or 1913 for history of changes prior to Oct. 1, 1960.
REMARKS.--Records good except those for winter periods, which are fair. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft (17.4 hm³) at elevation 1,070 ft (326.136 m) National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft (169 hm³), available for flood control; other controlled lakes and ponds, and several powerplants. Some small diversions for municipal supply. Figures of daily discharge do not include diversions to cities of Fargo and Moorhead and from Sheyenne River.
AVERAGE DISCHARGE (UNADJUSTED).--82 years, 552 ft³/s (15.63 m³/s), 399,900 acre-ft/yr (493 hm³/yr); median of yearly mean discharges, 442 ft³/s (12.5 m³/s), 320,200 acre-ft/yr (395 hm³/yr).
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 25,300 ft³/s (716 m³/s) Apr. 15, 1969, gage height, 37.34 ft (11.381 m); no flow for many days in each year for period 1932-41, Sept. 30, Oct. 1, 2, 1970, Oct. 10-19, 1976.
EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1897 reached a stage of 39.1 ft (11.92 m) present datum, discharge, 25,000 ft³/s (708 m³/s) at site 1.5 mi (2.4 km) downstream.
EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,750 ft³/s (49.6 m³/s) July 4, gage height, 15.99 ft (4.874 m); minimum daily, 146 ft³/s (4.13 m³/s) Oct. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	146	388	355	270	300	332	1030	465	289	173	388	504
2	180	395	416	300	290	350	1090	465	285	190	365	513
3	176	400	415	330	280	380	1000	452	285	542	324	451
4	180	391	420	342	280	399	970	443	280	1620	318	446
5	179	394	441	330	255	450	960	452	275	1570	302	433
6	268	393	443	320	230	525	900	459	246	1140	290	409
7	229	387	414	320	240	760	830	468	236	718	280	393
8	250	388	360	320	270	765	770	447	193	514	263	376
9	501	389	250	320	290	620	680	425	169	419	253	368
10	561	424	199	300	280	500	617	435	164	364	258	377
11	674	445	226	300	290	360	577	469	176	307	263	374
12	804	417	275	310	300	250	540	472	193	268	258	382
13	821	343	302	280	312	290	525	434	207	238	268	378
14	822	225	318	240	322	478	507	390	214	213	274	376
15	827	192	339	230	330	530	509	359	208	192	274	395
16	796	209	357	262	340	620	503	348	222	152	296	367
17	772	378	352	270	340	780	513	353	235	249	296	352
18	712	518	350	285	341	840	512	356	235	528	296	346
19	618	537	315	292	332	895	507	353	244	814	302	344
20	545	528	310	310	323	970	515	375	254	757	308	335
21	492	431	305	308	312	1000	529	371	257	709	324	326
22	468	400	310	300	318	1040	528	373	260	753	313	319
23	466	365	330	298	321	1020	520	380	239	879	308	303
24	490	255	334	298	299	1000	500	360	251	881	308	302
25	460	185	353	295	294	995	486	357	221	769	318	295
26	432	220	364	290	305	970	478	360	201	668	313	275
27	414	280	344	280	317	960	480	332	184	598	308	279
28	404	330	299	268	312	940	466	338	185	514	337	277
29	397	330	265	275	---	920	462	332	214	431	323	269
30	390	330	280	290	---	900	464	325	202	394	318	307
31	390	---	270	300	---	930	---	293	---	365	379	---
TOTAL	14864	10867	10311	9133	8423	21769	18968	12241	6824	17929	9425	10871
MEAN	479	362	333	295	301	702	632	395	227	578	304	362
MAX	827	537	443	342	341	1040	1090	472	289	1620	388	513
MIN	146	185	199	230	230	250	462	293	164	152	253	269
AC-FT	29480	21550	20450	18120	16710	43180	37620	24280	13540	35560	18690	21560
†	1138	1013	1058	1116	1021	1006	1013	1257	1429	1402	1715	1161
MEAN ‡	498	379	350	313	319	719	649	415	251	601	332	382
AC-FT ‡	30620	22560	21510	19240	17730	44190	38630	25540	14970	36960	20400	22720

OBSERVED — ADJUSTED

CAL YR 1982 TOTAL 232386 MEAN 637 MAX 5800 MIN 45 AC-FT 460900 — MEAN 658 AC-FT 476110
WTR YR 1983 TOTAL 151625 MEAN 415 MAX 1620 MIN 146 AC-FT 300700 — MEAN 434 AC-FT 315069

† Diversions in acre-feet to cities of Fargo and Moorhead.
‡ Adjusted for diversions to cities of Fargo and Moorhead.

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05054000 RED RIVER OF THE NORTH AT FARGO, ND--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1956 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)
MAR												
29...	1015	937	460	7.8	.5	.5	42	24	16	8.5	64	9.9
AUG												
31...	1445	397	436	7.9	32.0	27.0	40	29	11	6.4	33	9.6

DATE	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)
MAR											
29...	.10	12	304	3	40	80	6	14	10	.0	0
AUG											
31...	.20	19	258	8	60	30	2	20	10	.4	0

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05054020 RED RIVER OF THE NORTH BELOW FARGO, ND

WATER-QUALITY RECORDS

LOCATION.--LAT 46°55'50", long 96°47'05", in SW¼NE¼ sec.19, T.140 N., R.48 W., Cass County, Hydrologic Unit 09020104, at bridge on county highway 2 mi (3.2 km) north of North Dakota State University campus in Fargo, and 12 mi (19 km) above mouth of Sheyenne River.

DRAINAGE AREA.--6,820 mi^2 (17,660 km^2), approximately.

PERIOD OF RECORD.--Water years 1969 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
OCT												
06...	1405	225	405	7.7	10.0	10.5	20	35	26	13	5.2	35
NOV												
17...	1015	361	570	8.1	5.0	1.0	15	44	32	16	5.3	64
DEC												
21...	1415	307	610	8.4	-1.0	.5	<1	54	41	22	7.3	92
FEB												
04...	1220	280	460	8.0	-8.0	.0	<1	49	40	20	5.6	53
MAR												
29...	1015	937	510	7.8	.5	.5	30	45	24	17	7.8	71
MAY												
04...	1110	445	665	8.7	8.0	12.0	5	50	36	23	13	53
JUN												
22...	1130	260	498	7.9	23.0	23.0	10	43	29	15	5.4	44
JUL												
25...	1700	756	511	7.9	32.0	28.0	25	50	24	14	6.6	110
AUG												
31...	1550	397	475	7.8	32.0	26.5	20	39	28	13	4.7	23

DATE	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)
OCT						
06...	8.3	.20	9.7	235	.400	.080
NOV						
17...	11	.20	12	324	.300	.070
DEC						
21...	15	.20	14	412	<.100	.060
FEB						
04...	12	.20	17	352	.240	.200
MAR						
29...	10	.20	15	290	.960	.200
MAY						
04...	33	.20	6.0	387	.580	.090
JUN						
22...	12	.20	46	279	.260	.110
JUL						
25...	6.5	.20	21	331	.590	.240
AUG						
31...	7.4	.20	18	256	.170	.100

DATE	TIME	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)
MAR						
29...	1015	2	53	<1	<10	2
AUG						
31...	1550	7	110	<1	<10	40

DATE	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)	CYANIDE TOTAL (MG/L AS CN) (00720)
MAR											
29...	10	58	7	23	18	<.1	2	<1	2	6	<.01
AUG											
31...	5	6	<1	31	6	<.1	<1	1	6	8	<.01

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05061000 BUFFALO RIVER NEAR HAWLEY, MN

LOCATION.--Lat 46°51'00", long 96°19'45", in NW¼SE¼ sec.14, T.139 N., R.45 W., Clay County, Hydrologic Unit 09020106, near left downstream end of bridge on farm lane, 2 mi (3 km) southwest of Hawley.

DRAINAGE AREA.--322 mi^2 (834 km^2).

PERIOD OF RECORD.--March 1945 to September 1980, annual maximum discharge WY 1981, March 1982 to August 1982, March 1983 to September 1983.

REVISED RECORDS.--WSP 1308: 1945-46(M), 1948(M).

GAGE.--Water-stage recorder. Datum of gage is 1,111.91 ft (338.910 m) National Geodetic Vertical Datum of 1929. Prior to Jan. 29, 1953, nonrecording gage at bridge 1,800 ft (549 m) upstream at datum 3.17 ft (0.97 m) lower.

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--35 years (water years 1945-80), 72.7 ft^3/s (2.059 m^3/s), 52,670 acre-ft/yr (64.9 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,050 ft^3/s (58.1 m^3/s) July 1, 1975, gage height, 9.76 ft (2.975 m); minimum, 2.8 ft^3/s (0.079 m^3/s) Aug. 26, 1977; minimum gage height, 2.55 ft (0.777 m) Sept. 5, 1961.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known, about 11.3 ft (3.44 m), present datum, spring of 1921, from information by local resident.

EXTREMES FOR CURRENT PERIOD:--March to September 1983: Maximum discharge during period, 1,080 ft^3/s (30.6 m^3/s) July 5, gage height, 8.96 ft (2.731 m); minimum discharge, 27 ft^3/s (0.76 m^3/s) Mar. 1, June 11; minimum gage height, 3.43 ft (1.045 m) June 11.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1						27	87	54	47	107	154	96
2						31	89	53	46	170	138	86
3						33	89	50	42	565	120	78
4						33	87	47	39	971	107	73
5						40	84	46	35	1010	95	69
6						58	81	44	35	1010	85	66
7						90	79	43	36	896	76	61
8						130	76	43	33	789	69	56
9						118	74	42	30	692	63	47
10						108	73	42	28	599	62	44
11						125	72	47	31	507	63	41
12						120	77	49	46	425	61	40
13						145	81	53	49	344	56	38
14						150	80	59	54	279	54	37
15						135	77	70	64	228	48	38
16						110	72	72	80	246	46	43
17						105	69	68	78	318	47	51
18						100	66	62	67	598	47	51
19						94	63	56	54	669	44	48
20						103	63	51	46	603	42	48
21						99	60	48	40	621	43	43
22						99	65	47	39	613	43	40
23						95	67	46	46	541	44	38
24						87	59	47	50	461	42	38
25						82	54	49	95	377	41	35
26						82	52	49	172	296	40	33
27						80	53	49	177	250	42	35
28						74	54	48	103	218	46	35
29						72	53	48	71	186	85	33
30						80	53	45	72	176	123	33
31						82	---	45	---	159	113	---
TOTAL						2787	2109	1572	1805	14924	2139	1474
MEAN						89.9	70.3	50.7	60.2	481	69.0	49.1
MAX						150	89	72	177	1010	154	96
MIN						27	52	42	28	107	40	33
CFSM						.28	.22	.16	.19	1.49	.21	.15
IN.						.32	.24	.18	.21	1.72	.25	.17
AC-FT						5530	4180	3120	3580	29600	4240	2920

BEST COPY AVAILABLE

05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN

LOCATION.--Lat 46°46'20", long 96°37'40", in SW¼SW¼ sec.9, T.138 N., R.47 W., Clay County, Hydrologic Unit 09020106, near center of span on downstream side of highway bridge, 0.3 mi (0.5 km) downstream from Stony Creek and 1 mi (1.6 km) east of Sabin.

DRAINAGE AREA.--522 mi^2 (1,351 km^2).

PERIOD OF RECORD.--March 1945 to September 1980, annual maximum discharge WY 1981, March to August 1982, March to August 1983.

REVISED RECORDS.--WSP 1308: 1949(M).

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 902.39 ft (275.05 m) National Geodetic Vertical Datum of 1929 (levels by Soil Conservation Service). Prior to Aug. 17, 1948, nonrecording gage at site 1 mi (1.6 km) downstream at different datum.

REMARKS.--Records fair except those for winter period, which are poor.

AVERAGE DISCHARGE.--35 years (water years 1945-80), 56.0 ft^3/s (1.586 m^3/s), 40,570 acre-ft/yr (50.0 hm^3/yr); median of yearly mean discharges, 41.4 ft^3/s (1.172 m^3/s), 29,990 acre-ft/yr (37.0 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,500 ft^3/s (241 m^3/s) July 2, 1975, gage height, 19.90 ft (6.066 m); no flow for many days in most years.

EXTREMES FOR CURRENT PERIOD.--March to August 1983: Maximum discharge during period, 1,500 ft^3/s (42.5 m^3/s) July 5, gage height, 14.03 ft (4.276 m) from highwater mark; minimum daily discharge, 0.22 ft^3/s (0.006 m^3/s) Aug. 18, gage height, 3.33 ft (1.015 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1						16	100	31	9.4	14	47	
2						18	100	32	9.1	15	57	
3						18	90	30	8.2	102	52	
4						20	75	28	7.4	663	43	
5						32	60	25	5.8	1410	37	
6						70	65	26	4.1	1230	30	
7						100	50	25	2.9	920	25	
8						100	50	24	1.7	705	20	
9						105	47	23	1.0	576	16	
10						107	44	21	.62	446	12	
11						85	42	20	.52	313	7.0	
12						80	40	24	1.8	181	3.8	
13						85	38	35	4.3	117	2.1	
14						95	34	52	4.3	84	1.6	
15						160	29	64	5.4	64	.96	
16						190	30	66	6.1	55	.42	
17						205	31	60	9.6	108	.68	
18						225	33	53	14	284	.22	
19						240	31	47	14	421	.74	
20						225	28	41	16	469	1.0	
21						215	26	36	14	419	.90	
22						180	26	34	13	320	.80	
23						150	28	32	13	222	2.0	
24						130	30	31	11	148	3.2	
25						115	32	28	11	103	1.9	
26						110	30	24	9.7	78	2.0	
27						100	31	21	8.4	60	3.6	
28						95	30	18	8.7	47	2.6	
29						90	30	16	12	38	1.6	
30						90	31	14	14	35	1.7	
31						95	---	12	---	37	3.9	
TOTAL						3546	1311	993	241.04	9684	381.72	
MEAN						114	43.7	32.0	8.03	312	12.3	
MAX						240	100	66	16	1410	57	
MIN						16	26	12	.52	14	.22	
CFSM						.22	.08	.06	.02	.60	.02	
IN.						.25	.09	.07	.02	.69	.03	
AC-FT						7030	2600	1970	478	19210	757	

BEST COPY AVAILABLE

05062000 BUFFALO RIVER NEAR DILWORTH, MN

LOCATION.--Lat 46°57'40", long 96°39'40", in SW¼SE¼ sec.6, T.140 N., R.47 W., Clay County, Hydrologic Unit 09020106, on left bank 4.5 mi (7.2 km) southeast of Kragnes, 6.5 mi (10.5 km) northeast of Dilworth, and 9 mi (14 km) downstream from South Branch.

DRAINAGE AREA.--1,040 mi^2 (2,690 km^2), approximately.

PERIOD OF RECORD.--March 1931 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1308: 1931(M).

GAGE.--Water-stage recorder. Datum of gage is 878.31 ft (267.709 m) National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers). Prior to Apr. 5, 1937, nonrecording gage at same site and datum.

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--52 years, 129 ft^3/s (3.653 m^3/s), 93,460 acre-ft/yr (115 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,600 ft^3/s (385 m^3/s) July 2, 1975, gage height, 27.10 ft (8.260 m); no flow at times in 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,990 ft^3/s (56.4 m^3/s) July 9, gage height, 16.75 ft (5.105 m); minimum, 16 ft^3/s (0.51 m^3/s) Oct. 1, gage height, 2.72 ft (0.829 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	67	50	30	23	40	225	101	70	85	248	118
2	27	63	55	30	23	40	220	102	72	105	232	107
3	30	63	60	29	23	45	220	101	69	160	243	97
4	36	62	70	29	23	55	215	96	60	293	232	87
5	38	58	70	29	23	65	215	92	53	580	202	81
6	42	63	80	28	23	120	210	89	49	1060	176	78
7	62	73	71	28	23	265	205	86	48	1560	158	73
8	80	60	65	27	23	250	190	85	54	1920	141	70
9	98	58	60	27	23	190	165	84	46	1970	125	66
10	213	58	55	26	23	183	150	81	40	1740	114	60
11	268	59	50	26	23	185	141	83	39	1490	105	53
12	267	59	45	26	24	160	139	107	39	1290	97	50
13	259	56	45	25	24	165	141	120	61	1060	93	48
14	250	61	40	25	24	190	140	122	70	750	84	45
15	247	67	40	25	24	195	136	131	72	526	77	44
16	245	64	35	25	25	210	127	156	82	406	71	45
17	231	59	35	25	25	250	121	160	97	387	64	48
18	221	57	35	24	26	290	120	149	88	534	62	56
19	207	56	35	24	28	305	119	134	75	697	62	60
20	183	56	35	24	30	305	114	121	66	875	58	57
21	159	48	35	24	30	305	113	113	62	1030	55	55
22	137	49	34	24	31	290	107	104	59	1100	54	59
23	119	62	34	23	32	275	110	99	55	1080	53	50
24	104	60	33	23	32	260	115	100	71	978	51	46
25	93	60	33	23	32	255	103	94	78	826	52	44
26	86	60	33	23	35	250	101	97	119	663	50	43
27	79	55	32	23	35	245	100	89	181	512	46	39
28	75	50	32	23	36	235	102	86	171	418	44	36
29	72	50	32	23	---	225	104	81	128	350	54	38
30	69	50	31	23	---	215	103	81	99	298	77	41
31	68	---	31	23	---	220	---	74	---	270	119	---
TOTAL	4087	1763	1391	787	746	6283	4371	3218	2273	25013	3299	1794
MEAN	132	58.8	44.9	25.4	26.6	203	146	104	75.8	807	106	59.8
MAX	268	73	80	30	36	305	225	160	181	1970	248	118
MIN	22	48	31	23	23	40	100	74	39	85	44	36
CFSM	.13	.06	.04	.02	.03	.20	.14	.10	.07	.78	.10	.06
IN.	.15	.06	.05	.03	.03	.22	.16	.12	.08	.89	.12	.06
AC-FT	8110	3500	2760	1560	1480	12460	8670	6380	4510	49610	6540	3560

CAL YR 1982 TOTAL 47033.2 MEAN 129 MAX 2160 MIN 8.1 CFSM .12 IN 1.68 AC-FT 93290
WTR YR 1983 TOTAL 55025.0 MEAN 151 MAX 1970 MIN 22 CFSM .15 IN 1.97 AC-FT 109100

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05062500 WILD RICE RIVER AT TWIN VALLEY, MN

LOCATION.--Lat 47°16'00", long 96°14'40", in NW¼NE¼ sec.27, T.144 N., R.44 W., Norman County, Hydrologic Unit 09020108, on left bank 100 ft (30 m) upstream from highway bridge, 0.8 mi (1.3 km) northeast of village of Twin Valley, and 2 mi (3 km) upstream from small tributary.

DRAINAGE AREA.--888 mi^2 (2,300 km^2).

PERIOD OF RECORD.--June 1909 to September 1917, July 1930 to September 1983 (discontinued as a continuous-record station; converted to a crest-stage partial-record station). Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 955: 1941. WSP 1308: 1915(M), 1917(M).

GAGE.--Water-stage recorder. Datum of gage is 1,008.16 ft (307.287 m) National Geodetic Vertical Datum of 1929 (Corps of Engineers bench mark). June 1909 to September 1917, nonrecording gage at site 0.2 mi (0.3 km) downstream at different datum. July 23, 1930, to Nov. 24, 1934, nonrecording gage at highway bridge 100 ft (30 m) downstream from present site at present datum. Nov. 25, 1934, to Aug. 2, 1950, water-stage recorder 80 ft (24 m) upstream from present site at present datum.

REMARKS.--Records good except those for winter period, which are fair. Flow slightly regulated by Rice Lake and many other small lakes above station.

AVERAGE DISCHARGE.--61 years, 173 ft^3/s (4.899 m^3/s), 125,300 acre-ft/yr (154 hm^3/yr); median of yearly mean discharges, 155 ft^3/s (4.39 m^3/s), 112,000 acre-ft/yr (138 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,200 ft^3/s (261 m^3/s) July 22, 1909, gage height, 20.0 ft (6.10 m), site and datum then in use, from rating curve extended above 3,300 ft^3/s (93.5 m^3/s); minimum, 0.5 ft^3/s (0.014 m^3/s) Nov. 4, 1939.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 635 ft^3/s (18.0 m^3/s) Mar. 7, gage height, 6.44 ft (1.963 m); minimum, 14 ft^3/s (0.40 m^3/s) Oct. 1, gage height, 1.15 ft (0.351 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	229	60	44	44	53	317	156	150	276	181	140
2	19	215	60	44	44	60	311	148	146	296	174	113
3	18	198	65	44	44	90	304	143	134	395	164	80
4	18	185	70	44	44	150	300	140	132	453	157	59
5	19	172	70	44	44	250	303	139	133	516	146	50
6	39	151	65	44	44	400	324	133	123	534	133	52
7	38	134	60	44	44	590	320	117	133	494	120	56
8	33	143	58	44	44	550	272	122	124	466	115	47
9	41	150	52	44	44	500	274	113	115	441	110	40
10	93	145	49	44	44	460	276	100	106	414	122	40
11	125	135	47	44	44	430	274	133	102	390	120	40
12	152	114	46	44	44	400	264	187	98	376	116	45
13	187	83	45	44	44	450	260	198	131	396	107	46
14	167	79	45	44	44	500	260	179	131	391	99	45
15	148	94	44	44	44	550	258	187	156	372	92	50
16	152	103	44	44	44	520	242	190	189	361	85	67
17	165	143	44	44	44	500	212	180	212	344	78	77
18	188	122	44	44	44	510	213	173	199	334	71	86
19	174	115	44	44	44	480	216	163	175	324	74	80
20	167	116	44	44	44	460	211	168	148	316	65	75
21	165	110	44	44	44	450	200	169	132	314	64	65
22	176	100	44	44	44	430	189	153	182	302	61	56
23	196	95	44	44	44	420	180	154	276	285	60	50
24	211	90	44	44	45	390	177	141	402	271	58	43
25	222	85	44	44	46	388	159	128	384	291	59	50
26	229	80	44	44	47	372	154	122	325	265	116	59
27	231	75	44	44	49	355	155	135	289	237	137	61
28	229	70	44	44	50	355	176	130	245	224	111	61
29	226	66	44	44	---	375	166	177	227	211	101	55
30	227	62	44	44	---	311	154	182	248	200	123	56
31	235	---	44	44	---	324	---	165	---	189	143	---
TOTAL	4305	3659	1540	1364	1249	12073	7121	4725	5547	10678	3362	1844
MEAN	139	122	49.7	44.0	44.6	389	237	152	185	344	108	61.5
MAX	235	229	70	44	50	590	324	198	402	534	181	140
MIN	15	62	44	44	44	53	154	100	98	189	58	40
CFSM	.16	.14	.06	.05	.05	.44	.27	.17	.21	.39	.12	.07
IN.	.18	.15	.06	.06	.05	.51	.30	.20	.23	.45	.14	.08
AC-FT	8540	7260	3050	2710	2480	23950	14120	9370	11000	21180	6670	3660

CAL YR 1982 TOTAL 71121 MEAN 195 MAX 1200 MIN 11 CFSM .22 IN 2.98 AC-FT 141100
WTR YR 1983 TOTAL 57467 MEAN 157 MAX 590 MIN 15 CFSM .18 IN 2.41 AC-FT 114000

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05064000 WILD RICE RIVER AT HENDRUM, MN

LOCATION.--Lat 47°16'05", long 96°47'50", in SE¼SE¼ sec.19, T.144 N., R.48 W., Norman County, Hydrologic Unit 09020108, near center of span on downstream side of highway bridge, 0.5 mi (0.8 km) east of Hendrum and 4 mi (6.4 km) upstream from mouth.

DRAINAGE AREA.--1,600 mi^2 (4,140 km^2), approximately.

PERIOD OF RECORD.--March 1944 to current year.

REVISED RECORDS.--WSP 1728: 1958.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 836.7. ft (255.041 m) National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers).

REMARKS.--Records fair. Large part of high flow diverted into Marsh River basin at overflow section 3.5 mi (5.6 km) east of Ada. Another diversion into the Marsh River basin formed in 1947, 1.5 mi (2.4 km) southeast of Ada and diverted water at all stages 1947-51, after which it was closed except for a small regulated flow diverted for abatement of pollution from Ada sewage plant effluent. Amount of diversion not known.

AVERAGE DISCHARGE.--39 years, 258 ft^3/s (7.307 m^3/s), 186,900 acre-ft/yr (230 hm^3/yr); median of yearly mean discharges, 213 ft^3/s (6.03 m^3/s), 154,000 acre-ft/yr (190 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,350 ft^3/s (265 m^3/s) Apr. 10, 1978, gage height, 31.42 ft (9.577 m); maximum gage height, 32.30 ft (9.845 m) Apr. 21, 1979, backwater from Red River of the North; no flow some days in 1948-49.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,290 ft^3/s (64.9 m^3/s) July 5, gage height, 15.12 ft (4.609 m), from graph based on gage readings; maximum gage height, 16.18 ft (4.932 m) Mar. 7, from highwater mark (backwater from ice); minimum daily discahrge, 21 ft^3/s (0.59 m^3/s) Oct. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	285	75	53	42	80	850	181	150	503	300	236
2	32	285	78	52	42	90	750	178	138	502	280	210
3	33	280	80	52	42	120	670	172	133	1100	282	188
4	29	255	83	52	42	220	600	160	126	2080	262	152
5	32	234	85	51	42	350	550	160	124	2230	240	125
6	38	214	85	51	41	550	500	156	122	2090	226	122
7	67	205	82	50	41	800	470	157	115	1830	202	110
8	101	200	79	50	41	1300	430	134	114	1500	186	100
9	472	180	76	49	41	1150	400	138	116	1170	173	91
10	444	200	73	49	41	1000	380	135	111	947	170	76
11	378	194	70	48	41	800	357	129	110	805	169	70
12	502	173	68	48	41	750	339	164	205	700	166	69
13	514	126	67	48	41	800	313	253	333	617	162	70
14	486	142	66	47	41	850	298	294	232	574	150	67
15	444	138	65	47	41	900	311	254	194	546	142	72
16	384	128	64	47	41	950	331	228	201	502	133	87
17	330	138	63	46	41	1000	289	228	234	492	128	81
18	300	154	62	46	42	1000	262	210	267	497	119	99
19	306	184	61	45	42	950	261	201	271	485	122	112
20	302	196	60	45	43	900	266	194	265	503	119	108
21	266	158	60	44	45	850	262	192	384	490	111	98
22	253	126	59	44	48	800	244	195	935	469	108	90
23	233	133	58	44	50	760	223	174	718	450	99	81
24	259	121	58	44	56	720	214	169	951	427	97	76
25	274	100	57	44	60	690	206	158	1560	400	100	71
26	283	96	57	44	65	660	195	142	1500	405	100	62
27	291	93	56	43	70	640	193	126	1070	388	103	70
28	295	90	56	43	75	640	189	125	810	372	195	73
29	295	85	55	43	---	640	197	126	634	339	181	76
30	280	80	55	42	---	660	199	136	550	320	170	74
31	282	---	54	42	---	750	---	165	---	314	231	---
TOTAL	8226	4993	2067	1453	1298	22370	10749	5434	12673	24047	5226	3016
MEAN	265	166	66.7	46.9	46.4	722	358	175	422	776	169	101
MAX	514	285	85	53	75	1300	850	294	1560	2230	300	236
MIN	21	80	54	42	41	80	189	125	110	314	97	62
CFSM	.17	.10	.04	.03	.03	.45	.22	.11	.26	.49	.11	.06
IN.	.19	.12	.05	.03	.03	.52	.25	.13	.29	.56	.12	.07
AC-FT	16320	9900	4100	2880	2570	44370	21320	10780	25140	47700	10370	5980

CAL YR 1982 TOTAL 105654 MEAN 289 MAX 3250 MIN 13 CFSM .18 IN 2.46 AC-FT 209600
WTR YR 1983 TOTAL 101552 MEAN 278 MAX 2230 MIN 21 CFSM .17 IN 2.36 AC-FT 201400

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05064500 RED RIVER OF THE NORTH AT HALSTAD, MN

LOCATION.--Lat 47°21'10", long 96°50'50", on line between secs.24 and 25, T.145 N., R.49 W., Traill County, Hydrologic Unit 09020107, on left bank on upstream side of highway bridge, 0.5 mi (0.8 km) west of Halstad, 2.5 mi (4.0 km) downstream from Wild Rice River, and at mile 375.2 (603.7 km).

DRAINAGE AREA.--21,800 mi^2 (56,500 km^2), approximately, including 3,800 mi^2 (9,840 km^2) in closed basins.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1936 to June 1937 (no winter records), April 1942 to September 1960 (spring and summer months only), May 1961 to current year.

REVISED RECORDS.--WSP 1308: 1936, 1950. WSP 1728: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 826.65 ft (251.963 m) National Geodetic Vertical Datum of 1929. Prior to July 17, 1961, nonrecording gage at same site and datum.

REMARKS.--Records fair. Some regulation by many controlled lakes and reservoirs on tributaries.

AVERAGE DISCHARGE.--22 years (1961-83), 1,740 ft^3/s (49.28 m^3/s), 1,261,000 acre-ft/yr (1.55 km^3/yr); median of yearly mean discharges, 1,530 ft^3/s (43.3 m^3/s), 1,108,000 acre-ft/yr (1.4 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 42,000 ft^3/s (1,190 m^3/s) Apr. 22, 1979, gage height, 39.00 ft (11.887 m); minimum observed, 5.4 ft^3/s (0.15 m^3/s) Oct. 8, 9, 12-14, 1936.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in 1897 reached a stage of about 38.5 ft (11.73 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,800 ft^3/s (221 m^3/s) July 6, gage height, 14.98 ft (4.566 m); maximum gage height, 17.10 ft (5.212 m), Mar. 7, backwater from ice; minimum daily, 250 ft^3/s (7.08 m^3/s) Oct. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	250	886	870	480	320	500	5400	1360	843	3760	1310	832
2	259	870	880	470	310	550	5400	1290	808	3130	1230	870
3	269	854	890	470	300	580	5350	1220	776	3860	1190	946
4	312	832	970	470	290	650	5350	1160	762	5740	1140	930
5	312	830	1010	470	280	930	5300	1100	739	6660	1080	850
6	325	850	1050	470	280	2400	5200	1040	729	7050	1030	822
7	362	880	1060	470	280	5000	4900	990	710	6750	954	798
8	472	890	1010	470	280	5110	4270	980	675	6020	874	812
9	585	900	920	480	270	4200	3650	990	659	5430	812	858
10	1050	910	800	470	270	3370	3120	1000	630	5100	759	864
11	2200	900	760	460	270	2900	2700	1020	588	4660	710	850
12	2390	890	590	450	280	2680	2440	1090	700	4080	684	850
13	2380	910	580	440	290	2600	2270	1210	1130	3510	671	843
14	2300	930	570	420	300	2570	2160	1300	994	3050	649	833
15	2140	950	570	400	320	2740	2150	1290	790	2620	633	818
16	1960	940	570	390	320	3060	2240	1240	770	2230	617	790
17	1820	1000	600	380	320	3430	2300	1210	814	1920	607	776
18	1700	1050	580	370	320	3760	2290	1170	798	1760	598	716
19	1620	1100	550	370	320	4140	2270	1100	812	1920	614	684
20	1640	1100	540	360	330	4480	2210	1050	804	2320	591	684
21	1600	1050	540	360	330	4750	2100	1010	946	2600	575	675
22	1500	1000	540	370	330	4900	2000	1010	2120	2650	572	665
23	1390	960	540	380	330	5200	1880	978	2800	2670	575	652
24	1280	900	540	380	340	5400	1730	922	2930	2710	575	620
25	1190	840	530	370	340	5400	1620	918	4270	2710	605	595
26	1140	840	550	360	350	5350	1560	906	4340	2570	625	572
27	1110	850	530	360	370	5400	1500	902	3630	2330	665	547
28	1060	840	520	360	470	5500	1470	826	3560	2060	735	528
29	1010	850	510	360	---	5500	1460	812	3970	1800	775	514
30	954	860	490	350	---	5450	1430	822	4100	1610	805	503
31	914	---	480	330	---	5400	---	840	---	1410	825	---
TOTAL	37494	27462	21140	12740	8810	113900	87720	32756	48197	106690	24085	22297
MEAN	1209	915	682	411	315	3674	2924	1057	1607	3442	777	743
MAX	2390	1100	1060	480	470	5500	5400	1360	4340	7050	1310	946
MIN	250	830	480	330	270	500	1430	812	588	1410	572	503
AC-FT	74370	54470	41930	25270	17470	225900	174000	64970	95600	211600	47770	44230

WTR YR 1983 TOTAL 543291 MEAN 1488 MAX 7050 MIN 250 AC-FT 1078000

BEST COPY AVAILABLE

05064500 RED RIVER OF THE NORTH AT HALSTAD, MN--Continued
(National stream-quality accounting network station)
(Radiochemical station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1961-67, 1972 to current year.

REMARKS.--Letter K indicates non-ideal colony county.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
25...	1535	1180	708	702	8.3	8.1	12.0	7.5	739	45	10.8
JAN											
11...	1625	461	840	849	7.7	8.4	-13.0	.0	750	5.5	12.8
MAR											
21...	1355	4700	540	543	7.9	7.8	-1.5	.0	740	30	11.0
MAY											
17...	1020	1160	660	664	8.0	8.3	20.5	11.0	--	33	8.1
JUL											
13...	1345	3330	595	530	8.1	8.2	33.0	27.0	738	100	4.2
SEP											
01...	1550	807	458	462	8.1	7.9	32.0	28.0	738	100	6.1

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT											
25...	93	K63	330	58	31	33	7.9	130	16	.20	15
JAN											
11...	89	K130	K580	66	42	49	8.6	130	21	.20	15
MAR											
21...	78	--	K3900	47	22	31	11	79	13	.20	17
MAY											
17...	--	K5	K15	61	32	30	8.2	100	14	.20	8.6
JUL											
13...	55	130	310	47	20	15	6.3	76	11	.30	21
SEP											
01...	81	720	340	48	25	17	6.2	50	11	.20	16

BEST COPY AVAILABLE

05064500 RED RIVER OF THE NORTH AT HALSTAD, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P) (00671)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT										
25...	459	.280	.120	1.7	.130	.250	.170	91	290	100
JAN										
11...	537	.300	.240	1.5	.130	.100	.060	--	--	--
MAR										
21...	313	1.40	.230	2.4	.380	.260	.190	102	1290	100
MAY										
17...	416	.100	.070	2.2	.190	.070	.050	85	266	95
JUL										
13...	356	.610	.170	2.6	.360	.280	.210	286	2570	100
SEP										
01...	272	.470	.060	1.4	.240	.110	.100	233	508	--

DATE	TIME	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	SILVER, DISSOLVED (UG/L AS AG) (01075)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
OCT												
25...	1535	5	77	<1	<1	<3	4	15	4	5	<1	6
MAR												
21...	1355	4	65	<1	<1	<3	2	76	<1	46	<1	110
MAY												
17...	1020	3	80	<1	<1	<3	3	10	<1	3	<1	6
SEP												
01...	1550	6	67	26	<1	<3	7	6	190	2	<1	32

DATE	TIME	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DISSOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L) (09511)
MAR								
21...	1355	<6.3	11	13	7.3	13	6.9	.08

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05067500 MARSH RIVER NEAR SHELLY, MN

LOCATION.--Lat 47°24'45", long 96°45'50", in NE¼NW¼ sec.3, T.145 N., R.48 W., Norman County, Hydrologic Unit 09020107, near center of span on downstream truss of bridge, 3.8 mi (6.1 km) southeast of Shelly and 10 mi (16 km) upstream from mouth.

DRAINAGE AREA.--151 mi^2 (391 km^2).

PERIOD OF RECORD.--March 1944 to September 1983 (discontinued as a continuous-record station; converted to a crest-stage partial-record station). Monthly discharge only for March 1944, published in WSP 1308.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 841.14 ft (356.379 m) National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers). Prior to Oct. 1, 1965, nonrecording gage at datum 3.0 ft (0.914 m) higher.

REMARKS.--Records poor. Large part of high flow of Wild Rice River diverted into Marsh River basin at overflow section 4.6 mi (5.6 km) east of Ada. Another diversion from Wild Rice River basin formed in 1947, 1.5 mi (2.4 km) southeast of Ada and diverted water at all stages 1947-51, after which it was closed except for a small regulated flow diverted for abatement of pollution from Ada sewage plant effluent.

AVERAGE DISCHARGE.--39 years, 65.5 ft^3/s (1.855 m^3/s), 47,450 acre-ft/yr (58.5 hm^3/yr); median of yearly mean discharges, 38 ft^3/s (1.08 m^3/s), 27,500 acre-ft/yr (34 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,880 ft^3/s (138 m^3/s) Apr. 19, 1979, gage height, 23.36 ft (7.120 m), from floodmark; no flow for many days most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,240 ft^3/s (35.1 m^3/s) Mar. 8, gage height, 13.84 ft (4.218 m); no flow Oct. 1-6.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	8.2	9.5	2.5	.20	2.1	363	5.5	1.8	78	1.6	58
2	.00	8.0	14	2.3	.18	5.2	267	5.0	1.7	71	1.6	38
3	.00	8.4	16	2.1	.17	15	200	4.6	1.6	245	1.6	25
4	.00	9.3	10	2.1	.17	35	178	4.3	1.6	294	1.6	24
5	.00	8.2	13	2.1	.17	134	159	4.0	1.5	263	1.6	24
6	.00	8.2	12	2.0	.18	489	150	3.7	1.4	238	1.6	25
7	.25	8.5	9.3	2.0	.02	805	110	3.5	1.4	159	1.7	17
8	.62	9.0	7.0	2.0	.10	1120	90	3.3	1.3	98	1.8	8.2
9	4.8	8.4	5.0	2.0	.20	865	75	3.0	1.2	69	1.6	4.4
10	35	9.0	3.9	2.0	.10	657	65	3.0	.96	54	1.5	5.2
11	50	9.3	2.5	2.0	.06	528	55	3.2	.89	37	1.4	4.0
12	39	8.2	2.6	2.0	.04	383	45	3.5	79	27	1.4	2.1
13	34	8.0	2.8	1.9	.10	366	40	4.0	1020	19	1.4	3.2
14	31	7.4	3.2	1.9	.56	368	35	4.5	894	14	1.2	3.2
15	30	6.8	3.7	1.9	.12	352	30	5.5	556	12	1.1	6.6
16	26	6.8	2.7	1.7	.82	285	26	6.0	352	7.4	1.1	36
17	20	6.6	2.0	1.4	1.2	424	23	6.5	258	6.2	1.3	36
18	16	6.4	1.8	1.2	1.6	429	21	7.0	175	5.2	1.4	41
19	12	6.6	2.2	1.0	2.2	396	19	7.0	108	3.6	1.3	38
20	10	7.2	2.7	.89	1.9	342	17	6.5	77	3.6	1.4	34
21	7.2	6.4	2.4	.75	1.6	285	15	6.0	145	3.1	1.3	26
22	5.0	6.0	2.2	.62	1.5	241	13	5.5	646	2.7	1.3	20
23	5.2	6.4	3.1	.56	1.6	199	12	5.0	926	2.0	1.1	17
24	5.6	6.8	3.1	.50	1.0	192	11	4.5	701	1.7	1.4	13
25	4.8	6.7	3.1	.35	.68	199	10	4.0	550	2.2	2.0	11
26	5.8	6.6	3.1	.20	.56	232	9.0	3.5	365	1.8	102	8.0
27	5.0	6.0	3.1	.20	3.2	241	8.0	3.0	228	2.1	88	8.0
28	5.2	6.0	2.9	.20	1.9	223	7.0	2.7	136	1.9	62	6.6
29	5.4	6.2	2.7	.28	---	240	6.5	2.4	94	1.6	127	7.0
30	6.0	7.2	2.2	.24	---	251	6.0	2.2	87	1.6	132	6.0
31	7.0	---	2.5	.20	---	312	---	2.0	---	2.0	87	---
TOTAL	370.87	223.8	156.3	41.09	22.13	10615.3	2065.5	134.4	7412.35	1726.7	634.3	555.5
MEAN	12.0	7.46	5.04	1.33	.79	342	68.9	4.34	247	55.7	20.5	18.5
MAX	50	9.3	16	2.5	3.2	1120	363	7.0	1020	294	132	58
MIN	.00	6.0	1.8	.20	.02	2.1	6.0	2.0	.89	1.6	1.1	2.1
CFSM	.08	.05	.03	.009	.005	2.27	.46	.03	1.64	.37	.14	.12
IN.	.09	.06	.04	.01	.01	2.62	.51	.03	1.83	.43	.16	.14
AC-FT	736	444	310	82	44	21060	4100	267	14700	3420	1260	1100

CAL YR 1982 TOTAL 13967.65 MEAN 38.3 MAX 980 MIN .00 CFSM .25 IN 3.44 AC-FT 27700
WTR YR 1983 TOTAL 23958.24 MEAN 65.6 MAX 1120 MIN .00 CFSM .43 IN 5.90 AC-FT 47520

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05069000 SAND HILL RIVER AT CLIMAX, MN

LOCATION.--Lat 47°36'43", long 96°48'52", in NE¼NE¼ sec.30, T.148 N., R.48 W., Polk County, Hydrologic Unit 09020301, near center of span on downstream side of bridge on U.S. Highway 75 in Climax and 3.7 mi (6.0 km) upstream from mouth.

DRAINAGE AREA.--426 mi^2 (1,103 km^2).

PERIOD OF RECORD.--March 1943 to current year (winter records incomplete prior to 1947). Monthly discharge only for some periods, published in WSP 1308 and 1728.

REVISED RECORDS.--WSP 1388: 1943(M), 1944, 1947(M). WSP 1728: 1951(M), 1960 (Average discharge).

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 820.10 ft (249.966 m) National Geodetic Vertical Datum of 1929 (levels by Corps of Engineers). Prior to Oct. 1, 1966, nonrecording gage at site 3.2 mi (5.1 km) upstream at datum 12.78 ft (3.90 m) higher. Nonrecording gage and crest-stage gage at site 3.2 mi (5.1 km) upstream at datum 12.78 ft (3.90 m) higher (used as supplementary gage during periods of backwater from the Red River).

REMARKS.--Records good except those for the winter period, which are poor.

AVERAGE DISCHARGE.--37 years (water years 1947-83), 70.4 ft^3/s (1.994 m^3/s), 51,000 acre-ft/yr (62.9 hm^3/yr); median of yearly mean discharges, 51 ft^3/s (1.44 m^3/s), 36,900 acre-ft/yr (45 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,560 ft^3/s (129 m^3/s) Apr. 14, 1965, gage height, 17.81 ft (5.428 m), site and datum then in use; maximum gage height, 32.79 ft (9.994 m) Apr. 23, 1979, from floodmark (backwater from Red River of the North); minimum daily discharge, 1.0 ft^3/s (0.03 m^3/s) Jan. 17, 18, 1962.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,230 ft^3/s (34.8 m^3/s) June 14, gage height, 11.00 ft (3.353 m), from high-water mark; maximum gage height, 13.78 ft (4.200 m) Mar. 7 (backwater from ice); minimum daily discharge, 12 ft^3/s (0.34 m^3/s) Oct. 1-5.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12	32	25	21	17	35	500	56	39	220	62	68
2	12	31	30	21	17	40	500	52	39	214	62	67
3	12	29	35	21	17	45	500	47	40	203	65	75
4	12	32	40	21	17	60	483	42	44	274	68	87
5	12	36	37	21	17	200	440	48	39	192	69	98
6	14	34	35	20	17	700	401	36	36	188	64	89
7	24	33	33	20	17	550	374	34	32	188	59	85
8	29	32	32	20	17	500	317	32	28	181	56	84
9	111	31	31	20	17	450	171	33	24	168	52	75
10	209	30	30	20	17	400	135	32	21	151	49	65
11	216	29	29	20	17	350	121	31	24	136	46	60
12	277	19	28	20	17	350	106	38	25	122	44	57
13	167	30	27	20	17	400	100	54	1000	104	40	52
14	138	27	27	19	17	420	93	82	1210	95	35	51
15	128	26	26	19	17	450	88	96	503	84	33	73
16	118	25	26	19	17	430	84	97	300	76	31	95
17	112	25	25	19	17	400	77	91	195	71	29	82
18	107	25	25	19	17	380	74	86	135	65	28	99
19	109	25	24	19	17	360	69	70	115	62	30	78
20	96	25	24	18	18	340	67	60	98	60	31	68
21	91	25	23	18	19	320	65	56	250	57	27	69
22	75	25	23	18	20	300	82	61	340	51	25	75
23	67	25	23	18	21	280	79	77	544	48	23	74
24	62	25	22	18	22	260	80	66	354	45	24	73
25	57	25	22	18	24	250	72	57	291	60	34	70
26	50	25	22	18	26	240	73	51	230	73	82	71
27	46	25	22	18	28	240	71	47	216	69	75	63
28	51	25	22	18	30	300	98	45	210	62	73	59
29	49	25	22	18	---	350	61	42	222	61	73	52
30	37	25	22	18	---	450	61	40	239	66	76	46
31	35	---	21	17	---	500	---	38	---	64	66	---
TOTAL	2535	826	833	594	531	10350	5442	1697	6843	3510	1531	2160
MEAN	81.8	27.5	26.9	19.2	19.0	334	181	54.7	228	113	49.4	72.0
MAX	277	36	40	21	30	700	500	97	1210	274	82	99
MIN	12	19	21	17	17	35	61	31	21	45	23	46
CFSM	.19	.07	.06	.05	.05	.78	.43	.13	.54	.27	.12	.17
IN.	.22	.07	.07	.05	.05	.90	.48	.15	.60	.31	.13	.19
AC-FT	5030	1640	1650	1180	1050	20530	10790	3370	13570	6960	3040	4280

CAL YR 1982 TOTAL 24389.1 MEAN 66.8 MAX 800 MIN 5.5 CFSM .16 IN 2.13 AC-FT 48380
WTR YR 1983 TOTAL 36852.0 MEAN 101 MAX 1210 MIN 12 CFSM .24 IN 3.22 AC-FT 73100

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05074000 LOWER RED LAKE NEAR RED LAKE, MN

LOCATION.--Lat 47°57'27", long 95°16'34", in SW¼NW¼ sec.28, T.152 N., R.36 W., Clearwater County, Hydrologic Unit 09020302, on Red Lake Indian Reservation, on left bank just upstream from dam at outlet, 13 mi (21 km) northwest of village of Red Lake.

DRAINAGE AREA.--1,950 mi^2 (5,050 km^2), approximately.

PERIOD OF RECORD.--June 1930 to November 1932 (published as Red Lake at Redby), May 1933 to current year (published as Red Lake near Red Lake 1933-40); records on Upper Red Lake published as Red Lake at Waskish, April 1930 to September 1933, all in reports of Geological Survey. October 1921 to September 1929 gage heights at Redby and on Upper Red Lake at Waskish in files of Minnesota Department of Conservation (fragmentary).

GAGE.--Water-stage recorder. Datum of gage is 1,169.00 ft (356.311 m), adjustment of 1912 (levels by Corps of Engineers); gage readings have been reduced to elevations based on adjustment of 1912. May 1933 to Sept. 6, 1934, nonrecording gage at same site and datum. Nonrecording gages at Waskish and Redby at datum 69.00 ft (21.031 m) lower.

REMARKS.--Water level subject to fluctuation caused by change in direction and velocity of wind and by seiches.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 1178.53 ft (359.216 m) June 25, 1950; minimum recorded, 1169.80 ft (356.555 m) Nov. 20, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 1175.86 ft (358.402 m) Aug. 26; maximum daily, 1174.62 ft (358.024 m) Oct. 9; minimum, 1173.08 ft (357.555 m) Aug. 26; minimum daily, 1173.64 ft (357.725 m) Sept. 18.

MONTHEND ELEVATION, IN FEET, OCTOBER 1982 TO SEPTEMBER 1983

Oct. 31 ..... 1174.35	Feb. 28 ..... 1174.07	June 30 ..... 1174.20
Nov. 30 ..... 1174.42	Mar. 31 ..... 1174.29	July 31 ..... 1174.00
Dec. 31 ..... 1174.27	Apr. 30 ..... 1174.34	Aug. 31 ..... 1174.30
Jan. 28 ..... 1174.09	May 31 ..... 1174.13	Sept.30 .....1174.16

NOTE.--Mean daily gage heights are available.

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05074500 RED LAKE RIVER NEAR RED LAKE, MN

LOCATION.--Lat 47°57'27", long 95°16'35", in SW¼NW¼ sec.28, T.152 N., R.36 W., Clearwater County, Hydrologic Unit 09020302, on Red Lake Indian Reservation, on left bank 50 ft (15 m) downstream from dam at outlet of Lower Red Lake and 13 mi (21 km) northwest of village of Red Lake.

DRAINAGE AREA.--1,950 mi^2 (5,050 km^2), approximately.

PERIOD OF RECORD.--May 1933 to current year. Monthly discharge only for May 1933, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,167.00 ft (355.702 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 7, 1934, nonrecording gage at site 50 ft (15 m) upstream at datum 2.00 ft (0.610 m) higher. Sept. 7, 1934, to Nov. 26, 1951, water-stage recorder at present site at datum 2.00 ft (0.610 m) higher.

REMARKS.--Records fair except those for period of no gage-height record, July 4 to Aug. 7, which are poor. Flow completely regulated by outlet dam on Lower Red Lake.

AVERAGE DISCHARGE.--50 years, 492 ft^3/s (13.93 m^3/s), 356,500 acre-ft/yr (440 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,600 ft^3/s (102 m^3/s) June 25, 1950, gage height, 11.19 ft (3.411 m), affected by seiches and backwater from aquatic vegetation, present datum, from rating curve extended above 1,400 ft^3/s (39.6 m^3/s); no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 961 ft^3/s (27.2 m^3/s) Oct. 14, gage height, 5.23 ft (1.594 m); maximum gage height, 5.73 ft (1.747 m) Nov. 13 (backwater from ice); minimum daily discharge, 141 ft^3/s (3.99 m^3/s) Mar. 25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	859	867	750	750	852	644	525	522	620	592	650	375
2	867	878	750	750	848	651	532	567	620	592	650	451
3	852	882	750	800	850	648	536	612	630	600	650	451
4	852	878	750	900	850	640	542	609	630	600	650	474
5	848	870	750	946	850	651	542	602	634	600	600	474
6	885	859	750	942	850	662	546	606	637	600	580	474
7	900	874	750	934	850	550	560	620	634	600	580	464
8	882	859	750	919	844	301	560	609	640	600	578	461
9	904	856	750	904	833	267	553	595	637	600	564	464
10	938	863	750	878	833	216	567	609	640	600	584	468
11	938	863	750	893	837	198	560	612	648	600	570	454
12	942	850	750	900	833	167	546	612	651	600	560	448
13	949	850	750	880	844	169	560	612	662	600	553	445
14	946	850	750	878	841	160	570	612	673	600	550	438
15	946	800	750	900	756	150	542	598	648	600	550	438
16	930	750	750	919	648	152	519	598	673	600	550	441
17	930	700	750	900	634	148	512	606	680	600	550	438
18	934	650	750	900	626	148	525	612	673	650	550	448
19	930	620	750	900	634	146	529	616	666	650	550	438
20	927	600	750	900	651	148	522	620	662	650	550	438
21	911	600	750	900	640	148	529	616	655	650	550	435
22	904	600	750	867	655	152	529	626	634	650	550	428
23	900	600	750	856	644	145	529	626	634	650	550	419
24	900	600	750	867	640	141	542	630	626	650	450	416
25	896	600	750	900	637	140	536	626	616	650	384	412
26	896	600	750	900	637	141	564	620	612	650	381	409
27	889	600	750	900	648	145	564	620	609	650	369	406
28	889	600	750	900	648	141	539	644	609	650	357	397
29	893	650	750	882	---	237	536	630	602	650	351	286
30	878	750	750	874	---	495	525	634	595	650	342	258
31	870	---	750	867	---	512	---	620	---	650	337	---
TOTAL	27985	22419	23250	27406	20913	9213	16241	18941	19150	19284	16240	12848
MEAN	903	747	750	884	747	297	541	611	638	622	524	428
MAX	949	882	750	946	852	662	570	644	680	650	650	474
MIN	848	600	750	750	626	140	512	522	595	592	337	258
CFSM	.46	.38	.39	.45	.38	.15	.28	.31	.33	.32	.27	.22
IN.	.53	.43	.44	.52	.40	.18	.31	.36	.37	.37	.31	.25
AC-FT	55510	44470	46120	54360	41480	18270	32210	37570	37980	38250	32210	25480

CAL YR 1982 TOTAL 273882 MEAN 750 MAX 1060 MIN 80 CFSM .39 IN 5.22 AC-FT 543200
WTR YR 1983 TOTAL 233890 MEAN 641 MAX 949 MIN 140 CFSM .33 IN 4.46 AC-FT 463900

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05075000 RED LAKE RIVER AT HIGH LANDING, NEAR GOODRIDGE, MN

LOCATION.--Lat 48°02'34", long 95°48'28", in NW¼NW¼ sec.28, T.153 N., R.40 W., Pennington County, Hydrologic Unit 09020303, on left bank 50 ft (15 m) upstream from highway bridge at High Landing, 7 mi (11 km) south of Goodridge and 33 mi (53 km) upstream from Thief River.

DRAINAGE AREA.--2,300 mi^2 (6,000 km^2), approximately.

PERIOD OF RECORD.--September 1929 to current year. Prior to October 1930, published as "at Kratka".

GAGE.--Water-stage recorder. Datum of gage is 1,141.57 ft (347.951 m), adjustment of 1912 (levels by Corps of Engineers). See WSP 1308 or 1738 for history of changes prior to Oct. 1, 1949.

REMARKS.--Records good except those for winter period, which are fair. Flow regulated by outlet dam on Lower Red Lake.

AVERAGE DISCHARGE.--54 years, 549 ft^3/s (15.55 m^3/s), 397,800 acre-ft/yr (490 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,060 ft^3/s (115 m^3/s) July 7, 1975, gage height, 13.39 ft (4.081 m); maximum gage height, 13.44 ft (4.097 m) July 3, 1975; no flow during infrequent periods in 1931-34, 1936-37.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,510 ft^3/s (42.8 m^3/s) Oct. 12, gage height, 8.54 ft (2.603 m); maximum gage height, 9.06 ft (2.761 m) Mar. 6 (backwater from ice); minimum daily discharge, 183 ft^3/s (5.18 m^3/s) Mar. 26, 27; minimum gage height, 2.41 ft (0.735 m) Mar. 26, 27, 28.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1010	1230	850	900	940	740	864	683	736	859	669	446
2	1040	1230	900	900	940	740	886	675	721	854	665	421
3	1040	1230	1000	900	940	740	949	722	725	1030	668	481
4	1040	1220	1000	900	940	740	919	775	716	1140	664	537
5	1030	1210	1000	950	940	950	921	784	717	1130	661	575
6	1060	1200	850	955	940	1350	942	781	707	1080	645	592
7	1130	1180	650	955	940	1450	936	781	701	1020	625	598
8	1160	1160	800	955	940	820	932	778	699	958	601	605
9	1180	1170	1000	955	940	750	926	773	693	908	588	683
10	1300	1170	1100	955	940	710	909	765	695	863	603	725
11	1460	1170	1050	955	940	640	912	771	686	813	603	711
12	1500	1090	1050	955	940	600	904	809	698	772	595	700
13	1490	841	1050	955	940	720	889	845	976	748	576	691
14	1470	880	1000	955	940	640	869	829	1040	727	561	682
15	1430	1180	1000	955	940	540	852	827	1040	711	552	781
16	1410	1330	1000	955	800	450	830	819	948	705	539	1030
17	1410	1280	1000	950	750	360	807	799	882	700	539	1130
18	1400	1210	1000	950	740	330	790	783	826	689	536	1470
19	1400	1070	950	950	740	300	779	780	786	688	530	1340
20	1390	1040	950	950	740	280	769	784	754	680	522	1200
21	1380	803	950	950	740	260	757	779	741	692	1120	1100
22	1360	800	950	950	740	240	752	779	1020	697	1260	1030
23	1350	800	950	950	740	220	743	780	1120	689	1110	997
24	1340	800	950	950	740	200	724	772	1010	684	975	937
25	1320	800	950	950	740	189	720	763	932	680	848	890
26	1320	800	900	945	740	183	709	759	867	678	1060	860
27	1320	800	900	945	740	183	688	757	826	675	985	845
28	1310	800	900	945	740	186	703	747	795	670	789	827
29	1290	800	900	945	---	205	694	747	779	665	654	763
30	1260	800	900	945	---	417	689	756	833	662	573	613
31	1240	---	900	945	---	698	---	753	---	670	504	---
TOTAL	39840	31094	29350	29275	23790	16831	24764	23955	24669	24537	21820	24260
MEAN	1285	1036	947	944	850	543	825	773	822	792	704	809
MAX	1500	1330	1100	955	940	1450	949	845	1120	1140	1260	1470
MIN	1010	800	650	900	740	183	688	675	686	662	504	421
CFSM	.56	.45	.41	.41	.37	.24	.36	.34	.36	.34	.31	.35
IN.	.64	.50	.47	.47	.38	.27	.40	.39	.40	.40	.35	.39
AC-FT	79020	61670	58220	58070	47190	33380	49120	47510	48930	48670	43280	48120

CAL YR 1982	TOTAL	345048	MEAN 945	MAX 1610	MIN 304	CFSM .41	IN 5.58	AC-FT	684400	
WTR YR 1983	TOTAL	314185	MEAN 861	MAX 1500	MIN 183	CFSM .37	IN 5.08	AC-FT	623200	

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN

LOCATION.--Lat 48°11'08", long 96°10'11", in NW¼SW¼ sec.3, T.154 N., R.43 W., Marshall County, Hydrologic Unit 09020304, on right bank, 0.2 mi (0.3 km) upstream from highway bridge, 5 mi (8 km) north of city of Thief River Falls, 7 mi (11 km) upstream from mouth, and 9 mi (14 km) downstream from Mud Lake National Wildlife Refuge.

DRAINAGE AREA.--959 mi^2 (2,484 km^2).

PERIOD OF RECORD.--July 1909 to September 1917, April 1920 to September 1921, October 1922 to September 1924, October 1928 to September 1981, March 1982 to current year. Monthly discharge only for some periods, annual maximums for water years 1919, 1922, 1925, 1926, published in WSP 1308. October 1981 to February 1982, operated as a high-flow partial-record station.

REVISED RECORDS.--WSP 925: Drainage area. WSP 1308: 1917(M), 1924(M), 1929(M), 1931-33(M), 1935(M), 1937(M).

GAGE.--Water-stage recorder and control of grouted boulders. Datum of gage is 1,112.33 ft (339.038 m) National Geodetic Vertical Datum of 1929 (levels by Minnesota Department of Transportation). Prior to May 4, 1939, nonrecording gages at same site and datum.

REMARKS.--Records good except those for winter period, which are poor. Some regulation by Thief and Mud Lakes.

AVERAGE DISCHARGE.--65 years (water years 1910-17, 1921, 1923-24, 1929-81, 1983), 160 ft^3/s (4.531 m^3/s), 115,900 acre-ft/yr (143 hm^3/yr); median of yearly mean discharges, 108 ft^3/s (3.06 m^3/s), 78,200 acre-ft/yr (96 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,610 ft^3/s (159 m^3/s) May 13, 1950, gage height, 17.38 ft (5.297 m); no flow at times in some years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, about 1,500 ft^3/s (42.5 m^3/s) Mar. 7, gage height, 14.19 ft (4.325 m) (backwater from ice); minimum daily discharge, 0.73 ft^3/s (0.021 m^3/s) Feb. 10; minimum gage height, 4.19 ft (1.277 m) Feb. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	600	130	37	16	3.5	700	370	314	828	320	206
2	6.0	543	150	36	12	3.6	900	362	310	811	286	192
3	14	530	200	35	7.4	7.4	1000	367	295	841	281	189
4	15	515	190	34	4.3	50	1000	401	247	947	268	183
5	18	4[illegible]	180	30	2.7	200	1000	399	238	992	221	178
6	28	444	170	23	2.0	700	1000	390	232	997	218	173
7	113	431	160	19	1.2	1400	950	335	222	936	218	155
8	113	410	150	20	.90	1300	900	330	211	884	201	146
9	143	395	140	20	.81	1100	869	330	166	842	161	141
10	338	386	135	20	.73	1000	821	331	156	801	163	141
11	459	311	130	20	.77	950	796	333	129	742	163	148
12	441	410	125	20	.77	900	767	354	129	681	165	150
13	389	350	120	20	.81	1000	744	446	191	639	115	153
14	401	330	115	20	.95	1100	713	509	265	589	78	150
15	365	310	110	20	.95	1000	684	506	363	556	76	180
16	389	290	105	20	.95	850	587	463	441	511	78	220
17	371	270	100	19	1.1	750	565	403	421	497	83	230
18	359	250	95	19	.95	700	551	434	359	445	85	240
19	369	235	90	19	.95	600	541	406	304	356	87	240
20	495	220	85	19	1.1	550	532	392	281	383	91	250
21	595	210	70	19	1.2	500	520	379	355	378	220	240
22	584	200	50	19	1.2	470	476	377	731	333	317	240
23	568	190	48	18	1.2	440	364	362	1030	346	232	230
24	556	180	46	18	1.2	420	353	309	1020	346	223	210
25	549	170	44	18	1.2	410	349	296	920	335	234	200
26	610	165	43	18	1.2	400	348	293	852	310	260	190
27	604	160	42	17	1.6	400	384	285	806	284	317	180
28	604	150	41	17	2.9	400	496	209	791	279	249	170
29	652	145	40	17	---	400	384	215	758	325	214	160
30	658	140	39	16	---	410	373	261	778	331	197	150
31	636	---	38	16	---	450	---	256	---	330	243	---
TOTAL	11444.9	9430	3181	663	69.04	18864.5	19667	11103	13317	17875	6064	5635
MEAN	369	314	103	21.4	2.47	609	656	358	444	577	196	188
MAX	658	600	200	37	16	1400	1000	509	1030	997	320	250
MIN	2.9	140	38	16	.73	3.5	348	209	129	279	76	141
CFSM	.39	.33	.11	.02	.003	.64	.68	.37	.46	.60	.20	.20
IN.	.44	.37	.12	.03	.00	.73	.76	.43	.52	.69	.24	.22
AC-FT	22700	18700	6310	1320	137	37420	39010	22020	26410	35460	12030	11180

WTR YR 1983 TOTAL 117313.44 MEAN 321 MAX 1400 MIN .73 CFSM .34 IN 4.55 AC-FT 232700

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05078000 CLEARWATER RIVER AT PLUMMER, MN

LOCATION.--Lat 47°55'24", long 96°02'46", in SE¼SW¼ sec. 4, T. 151 N., R.42 W., Red Lake County, Hydrologic Unit 09020305, on right bank 200 ft (61 m) downstream from Soo Line Railroad bridge, 300 ft (91 m) downstream from bridge on U.S. Highway 59, 0.9 mi (1.4 km) northwest of railroad depot in Plummer, and 8 mi (13 km) upstream from Hill River.

DRAINAGE AREA.--512 mi^2 (1,326 km^2).

PERIOD OF RECORD.--April 1939 to September 1979. October 1979 to February 1982, annual maximums only. March 1982 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,099.12 ft (335.012 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Nov. 10, 1939, nonrecording gage at site 100 ft (30 m) upstream at same datum.

REMARKS.--Records good except those for winter period, which are fair. Since 1968, undetermined amounts of water diverted for the flooding of wild rice paddies upstream.

AVERAGE DISCHARGE.--41 years (water years 1940-79, 1983), 180 ft^3/s (5.098 m^3/s), 130,400 acre-ft/yr (161 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,940 ft^3/s (112 m^3/s) Apr. 25, 1979, gage height, 12.31 ft (3.752 m); maximum gage height, 12.37 ft (3.770 m) Apr. 18, 1979 (backwater form ice); minimum discharge, 2.5 ft^3/s (0.071 m^3/s) May 16, 17, 1977, gage height, 1.71 ft (0.521 m).

EXTREMES FOR CURRENT YEAR.--Peak discharge above base of 500 ft^3/s (14.2 m^3/s) and maximum (*):

Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)
Oct 12	1130	564	16.0	5.31	1.618
Mar. 7	1545	*1,200	34.0	*a10.17	3.100
Apr. 4	----	630	17.8	ice jam	
June 13	2300	991	28.1	6.88	2.097
June 24	0415	830	23.5	6.33	1.929
July 4	2245	622	17.6	5.55	1.692
Aug. 27	0115	957	27.1	6.77	2.063

a Backwater from ice.

Minimum daily discharge, 15 ft^3/s (0.42 m^3/s) Feb. 21; minimum gage height, 2.37 ft (0.722 m) Nov. 13.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	83	108	60	60	55	40	400	188	152	380	185	135
2	86	112	65	60	60	40	480	173	138	374	200	114
3	92	97	70	60	57	41	550	142	128	493	228	98
4	95	88	70	60	52	100	622	110	128	611	219	88
5	86	66	70	60	45	250	450	130	136	604	202	84
6	83	65	65	60	40	500	411	116	132	521	186	83
7	104	92	55	60	37	1100	373	107	173	427	182	80
8	132	88	50	60	65	1000	351	104	114	365	154	75
9	140	80	50	60	70	1000	377	106	90	311	131	72
10	236	69	55	60	75	750	327	100	76	269	152	70
11	473	56	60	60	85	420	331	94	71	235	158	66
12	557	64	58	58	95	380	320	116	86	214	147	65
13	533	56	57	55	70	440	316	161	773	203	139	65
14	459	52	58	55	55	480	329	198	817	193	137	66
15	386	50	60	55	55	480	300	206	652	185	131	100
16	344	50	60	55	50	420	271	196	650	172	112	200
17	317	50	60	55	35	320	260	179	495	169	103	300
18	308	50	55	55	25	260	239	176	378	166	96	410
19	283	55	55	55	25	220	206	156	299	165	90	386
20	261	60	55	55	20	220	193	170	245	168	87	248
21	245	70	57	55	15	210	168	201	213	177	115	181
22	225	65	60	55	20	190	148	205	501	179	246	147
23	213	60	60	55	30	160	158	212	785	179	229	121
24	198	55	60	55	40	180	187	187	810	180	274	104
25	188	55	58	52	20	200	200	166	658	166	338	90
26	179	55	56	50	35	190	193	176	485	180	739	84
27	176	55	55	50	30	230	196	146	367	189	864	79
28	172	55	55	50	30	220	212	142	303	187	444	75
29	164	55	55	50	---	220	182	156	263	190	263	66
30	134	55	55	50	---	220	174	160	296	198	200	60
31	118	---	58	50	---	290	---	160	---	191	162	---
TOTAL	7070	1988	1817	1730	1291	10771	8924	4839	10414	8241	6913	3812
MEAN	228	66.3	58.6	55.8	46.1	347	297	156	347	266	223	127
MAX	557	112	70	60	95	1100	622	212	817	611	864	410
MIN	83	50	50	50	15	40	148	94	71	165	87	60
CFSM	.45	.13	.11	.11	.09	.68	.58	.31	.68	.52	.44	.25
IN.	.51	.14	.13	.13	.09	.78	.65	.35	.76	.60	.50	.28
AC-FT	14020	3940	3600	3430	2560	21360	17700	9600	20660	16350	13710	7560

WTR YR 1983 TOTAL 67810 MEAN 186 MAX 1100 MIN 15 CFSM .36 IN 4.93 AC-FT 134500

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05078230 LOST RIVER AT OKLEE, MN

LOCATION.--Lat 47°50'35", long 95°51'30", in SE¼NE¼ sec.2, T.150 N., R.41 W., Red Lake County, Hydrologic Unit 09020305, on downstream side of bridge on State Highway 222 at northwest edge of Oklee, 12 mi (19 km) upstream from mouth.

DRAINAGE AREA.--266 mi^2 (689 km^2).

PERIOD OF RECORD.--April 1960 to September 1981, February 1982 to current year. Monthly and daily figures for April 1960, to June 1960, published in WSP 2113.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 1,126.94 ft (343.391 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 9, 1960, reference points at same site at datum 8.00 ft (2.438 m) higher. Sept. 9, 1960, to Sept. 30, 1964, nonrecording gage at same site at datum 8.00 ft (2.438 m) higher.

REMARKS.--Records poor.

AVERAGE DISCHARGE.--22 years, 75.1 ft^3/s (2.127 m^3/s), 54,410 acre-ft/yr (67.1 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,210 ft^3/s (90.9 m^3/s) Apr. 11, 1969, gage height, 14.91 ft (4.545 m), from floodmark; maximum gage height, 16.72 ft (5.096 m), present datum, May 24, 1962; no flow Feb. 16 to Mar. 21, 1963, Feb. 15 to Mar. 2, 1964, Jan. 6 to Mar. 11, 1977.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known since at least 1897, 18.39 ft (5.605 m) present datum, Apr. 21, 1950, from floodmarks, discharge, 2,790 ft^3/s (79.0 m^3/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 520 ft^3/s (14.7 m^3/s) Mar. 7, gage height, 13.29 ft (4.051 m) (backwater from ice); minimum daily, 7.8 ft^3/s (0.22 m^3/s) Sept. 26.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	36	17	12	11	16	200	54	55	128	23	30
2	10	34	20	12	11	17	230	51	50	152	20	25
3	10	32	25	12	11	28	250	48	48	211	19	22
4	10	31	23	12	11	60	220	45	47	185	18	20
5	11	30	22	11	11	150	183	41	36	166	17	18
6	11	29	21	11	11	300	131	39	30	149	16	16
7	11	28	20	11	11	500	108	35	18	121	15	14
8	15	27	19	11	11	450	103	31	14	103	15	13
9	15	26	18	11	11	300	97	29	16	88	14	12
10	50	25	17	11	11	200	90	30	9.6	75	14	11
11	369	24	16	11	11	170	81	48	12	62	13	11
12	333	23	15	11	11	150	72	99	30	51	13	10
13	256	22	15	11	11	300	73	144	172	34	13	10
14	217	21	14	11	11	260	79	128	181	20	12	13
15	163	20	14	11	11	230	75	111	161	27	12	21
16	113	20	14	11	11	200	72	97	181	24	12	31
17	100	19	13	11	11	180	62	94	128	26	11	28
18	99	19	13	11	11	160	60	90	110	21	11	47
19	90	18	13	11	11	140	57	86	100	30	11	34
20	80	18	13	11	12	130	63	89	83	61	11	32
21	72	18	13	11	12	120	58	81	98	50	11	26
22	68	18	13	11	12	110	64	91	282	32	12	24
23	65	18	13	11	13	100	62	89	483	48	9.6	17
24	63	18	12	11	13	95	59	83	315	38	36	13
25	57	17	12	11	13	90	58	76	193	28	47	9.3
26	54	17	12	11	14	90	62	75	154	36	214	7.8
27	50	17	12	11	14	90	61	81	118	23	99	11
28	46	17	12	11	15	90	60	73	93	25	52	13
29	43	17	12	11	---	100	66	68	77	24	50	11
30	40	17	12	11	---	120	61	59	113	15	40	25
31	38	---	12	11	---	150	---	54	---	21	35	---
TOTAL	2569	676	477	345	327	5096	2917	2219	3407.6	2074	895.6	575.1
MEAN	82.9	22.5	15.4	11.1	11.7	164	97.2	71.6	114	66.9	28.9	19.2
MAX	369	36	25	12	15	500	250	144	483	211	214	47
MIN	10	17	12	11	11	16	57	29	9.6	15	9.6	7.8
CFSM	.31	.09	.06	.04	.04	.62	.37	.27	.43	.25	.11	.07
IN.	.36	.09	.07	.05	.05	.71	.41	.31	.48	.29	.13	.08
AC-FT	5100	1340	946	684	649	10110	5790	4400	6760	4110	1780	1140

WTR YR 1983 TOTAL 21578.3 MEAN 59.1 MAX 500 MIN 7.8 CFSM .22 IN 3.02 AC-FT 42800

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN

LOCATION.--Lat 47°53'15", long 96°16'25", in NW¼NE¼ sec.22, T.151 N., R.44 W., Red Lake County, Hydrologic Unit 09020305, on left bank 40 ft (12 m) downstream from Great Northern Railroad bridge in Red Lake Falls, 1.4 mi (2.3 km) upstream from mouth, and 3 mi (5 km) downstream from Badger Creek.

DRAINAGE AREA.--1,370 mi^2 (3,550 km^2), approximately.

PERIOD OF RECORD.--June 1909 to September 1917, October 1934 to September 1981. Monthly discharge only for October, November, 1934, published in WSP 1308. October 1981 to February 1982, operated as a high-flow partial-record station. March 1982 to current year.

REVISED RECORDS.--WSP 355: 1911-12. WSP 1438: 1910-11, 1917(M).

GAGE.--Water-stage recorder. Datum of gage is 949.49 ft (289.405 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 12, 1911, nonrecording gage at site 0.5 mi (0.8 km) upstream and Sept. 12, 1911, to Sept. 30, 1917, nonrecording gage at site 40 ft (12 m) upstream at different datum.

REMARKS.--Records good except those for winter period, which are poor.

AVERAGE DISCHARGE.--56 years (1910-17, 1935-81, 1983), 316 ft^3/s (8.949 m^3/s), 228,900 acre-ft/yr (282 hm^3/yr); median of yearly mean discharges, 284 ft^3/s (8.04 m^3/s), 205,800 acre-ft/yr (254 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,300 ft^3/s (292 m^3/s) Apr. 25, 1979, gage height, 12.38 ft (3.773 m); maximum gage height, 15.85 ft (4.831 m) Mar. 6, 1983, from high-water mark (backwater from ice); no flow Sept. 15, 1936, Sept. 14, 1939, Aug. 19-22, 1940.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,190 ft^3/s (90.3 m^3/s) June 13, gage height, 7.05 ft (2.149 m); maximum gage height, 15.85 ft (4.831 m) Mar. 6, from high-water mark (backwater from ice); minimum daily discharge, 60 ft^3/s (1.70 m^3/s) Feb. 22; minimum gage height, 2.02 ft (0.616 m) Nov. 12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	104	196	120	105	95	90	900	327	307	766	246	329
2	117	191	120	105	95	100	1030	317	282	777	246	277
3	111	191	120	105	100	200	1090	289	259	1020	298	244
4	117	181	125	105	100	500	1160	240	235	1230	280	213
5	119	169	130	105	95	1000	1170	221	234	1120	270	187
6	126	134	130	105	90	1500	931	226	229	961	260	170
7	148	164	130	1110	80	3000	788	203	226	791	240	161
8	164	181	125	105	72	2000	713	188	228	676	220	153
9	260	166	125	105	90	1500	692	180	173	590	200	143
10	447	174	125	105	110	1100	653	178	147	511	210	135
11	988	159	120	100	110	900	624	184	129	442	230	135
12	1230	102	120	100	110	800	598	217	136	384	220	128
13	1160	137	120	100	120	1200	564	350	2270	346	210	128
14	988	160	117	100	140	1300	560	462	2550	311	200	129
15	822	150	115	100	120	1370	539	487	1600	282	190	159
16	700	140	115	100	100	1250	501	440	1370	263	185	351
17	621	130	115	100	90	1020	465	398	1160	247	180	463
18	558	130	115	100	80	850	446	361	859	248	175	1090
19	499	130	115	100	70	702	417	340	671	247	170	808
20	447	130	115	100	65	606	376	317	546	249	170	508
21	409	130	115	100	65	583	357	345	475	267	200	354
22	367	130	115	100	60	534	320	382	1480	276	250	278
23	339	130	110	100	62	476	310	399	2170	262	288	235
24	316	130	110	95	70	455	336	396	1820	259	429	202
25	298	130	110	95	90	472	358	358	1410	249	648	176
26	283	120	110	95	80	494	366	328	1010	227	1180	157
27	270	120	110	95	80	494	353	344	769	258	1560	146
28	260	120	110	90	85	507	374	316	644	272	1060	131
29	254	120	110	90	---	538	361	324	577	251	640	121
30	239	120	110	90	---	560	331	338	596	252	535	112
31	213	---	110	95	---	707	---	325	---	270	423	---
TOTAL	12974	4365	3637	4100	2524	26808	17683	9780	24562	14304	11613	7823
MEAN	419	146	117	132	90.1	865	589	315	819	461	375	261
MAX	1230	196	130	1110	140	3000	1170	487	2550	1230	1560	1090
MIN	104	102	110	90	60	90	310	178	129	227	170	112
CFSM	.31	.11	.09	.10	.07	.63	.43	.23	.60	.34	.27	.19
IN.	.35	.12	.10	.11	.07	.73	.48	.27	.67	.39	.32	.21
AC-FT	25730	8660	7210	8130	5010	53170	35070	19400	48720	28370	23030	15520

WTR YR 1983 TOTAL 140173 MEAN 384 MAX 3000 MIN 60 CFSM .28 IN 3.81 ACT-FT 278000

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN

LOCATION.--Lat 47°46'32", long 96°36'33", in SW¼SW¼ sec.30, T.150 N., R.46 W., Polk County, Hydrologic Unit 09020303, on right bank at downstream side of Sargent Street bridge in Crookston, 0.3 mi (0.5 km) downstream from Interstate Power Co.'s dam, 0.6 mi (1.0 km) downstream from bridge on U.S. Highway 75, and 53 mi (85 km) upstream from mouth.

DRAINAGE AREA.--5,280 mi^2 (13,680 km^2), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1901 to current year. Monthly discharge only for some periods, published in WSP 1308. Figures of daily discharge for Apr. 3-30, 1904, published in WSP 130, have been found unreliable and should not be used.

REVISED RECORDS.--WSP 1115: 1906, 1915-16, 1919-20, 1922, 1925, 1927, 1929. WSP 1308: 1916(M), 1919(M), 1928(M), 1930(M). See also PERIOD OF RECORD.

GAGE.--Water-stage recorder. Datum of gage is 832.72 ft (253.813 m) National Geodetic Vertical Datum of 1929. May 18, 1901, to June 30, 1909, nonrecording gage at bridge 300 ft (91 m) upstream at same datum. July 1, 1909, to Sept. 25, 1911, nonrecording gage, Sept. 26, 1911, to Sept. 30, 1919, water-stage recorder, Oct. 1, 1919, to Sept. 30, 1930, nonrecording gage, at present site and datum.

REMARKS.--Records good except those for winter period, which are fair. Diurnal fluctuation prior to 1975 caused by powerplant 1,000 ft (300 m) upstream. Runoff from 1,950 mi^2 (5,050 km^2) in the headwaters of Red Lake River is completely controlled by dam at outlet of Lower Red Lake. Flow partially affected by occasional regulation at Thief and Mud Lakes in Thief River basin (see station 05076000).

AVERAGE DISCHARGE.--82 years, 1,130 ft^3/s (32.00 m^3/s), 818,700 acre-ft/yr (1,010 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 28,400 ft^3/s (804 m^3/s) Apr. 12, 1969, gage height, 27.33 ft (8.330 m); no flow for part of July 13, 1960 (caused by regulation of powerplant upstream).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,330 ft^3/s (208 m^3/s) June 23, gage height, 13.98 ft (4.261 m); maximum gage height, 20.14 ft (6.139 m) Mar. 8, from high-water mark (backwater from ice); minimum discharge, 593 ft^3/s (16.8 m^3/s) Nov. 15, gage height, 3.98 ft (1.213 m), result of freezeup.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1130	2100	1300	1170	1030	860	2600	1420	1370	2400	1280	1590
2	1210	2040	1300	1160	1030	900	3700	1450	1360	2590	1170	1380
3	1190	2010	1350	1150	1030	950	4900	1430	1360	2800	1230	1100
4	1170	1960	1400	1150	1030	1000	4500	1350	1310	3730	1250	1010
5	1200	1930	1500	1140	1030	1200	3960	1390	1250	3900	1190	942
6	1230	1890	1500	1140	1030	1600	3600	1460	1160	3690	1150	1080
7	1360	1790	1400	1130	1030	2500	3200	1410	1170	3280	1060	962
8	1530	1860	1300	1120	1020	4000	2870	1340	1160	2920	1040	997
9	1720	1830	1100	1110	1020	5000	2760	1280	1050	2630	997	859
10	1980	1800	1000	1100	1020	5000	2650	1280	999	2450	954	1010
11	2910	1810	1200	1100	1020	2950	2470	1330	902	2220	943	964
12	3660	1630	1300	1100	1020	2760	2430	1360	1030	2080	887	1030
13	3700	1020	1350	1100	1020	3270	2340	1480	2810	1880	906	1020
14	3400	954	1400	1090	1020	3900	2270	1740	5720	1800	892	949
15	3090	919	1400	1080	1020	4250	2170	1930	4570	1660	829	1110
16	2840	1010	1400	1070	1020	4100	2070	1930	3760	1590	815	1650
17	2650	1190	1400	1070	980	3580	1990	1840	3420	1510	799	2620
18	2520	1550	1400	1060	930	2830	1870	1700	2790	1450	781	2900
19	2410	1760	1400	1060	880	2700	1880	1650	2320	1450	847	3310
20	2330	1740	1350	1060	860	2500	1750	1630	1950	1330	791	2940
21	2350	1710	1330	1060	850	2400	1690	1580	1740	1320	811	2410
22	2380	1370	1320	1050	850	2300	1670	1610	3040	1320	3020	1990
23	2340	1150	1300	1050	840	2200	1620	1610	6860	1330	3440	1680
24	2300	1330	1270	1050	840	2100	1480	1650	6350	1240	3160	1630
25	2250	1300	1260	1050	840	2100	1430	1570	4860	1270	3280	1390
26	2200	1300	1240	1050	840	2100	1480	1480	3740	1220	3770	1360
27	2220	1300	1220	1050	840	2100	1480	1460	3050	1210	5230	1200
28	2200	1300	1210	1050	850	2100	1450	1450	2610	1270	4760	1150
29	2170	1300	1200	1040	---	2100	1650	1370	2370	1200	3420	1060
30	2190	1300	1190	1040	---	2200	1580	1300	2310	1180	2450	974
31	2160	---	1180	1040	---	2300	---	1340	---	1240	1960	---
TOTAL	67990	46153	40470	33690	26790	79850	71510	46820	78391	61160	55112	44267
MEAN	2193	1538	1305	1087	957	2576	2384	1510	2613	1973	1778	1476
MAX	3700	2100	1500	1170	1030	5000	4900	1930	6860	3900	5230	3310
MIN	1130	919	1000	1040	840	860	1430	1280	902	1180	781	859
CFSM	.42	.29	.25	.21	.18	.49	.45	.29	.50	.37	.34	.28
IN.	.48	.33	.29	.24	.19	.56	.50	.33	.55	.43	.39	.31
AC-FT	134900	91540	80270	66820	53140	158400	141800	92870	155500	121300	109300	87800

CAL YR 1982 TOTAL 670126 MEAN 1836 MAX 8860 MIN 800 CFSM .35 IN 4.72 AC-FT 1329000
WTR YR 1983 TOTAL 652203 MEAN 1787 MAX 6860 MIN 781 CFSM .34 IN 4.60 AC-FT 1294000

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1962, 1974-76, 1979 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1980 to April 1983 (discontinued).
WATER TEMPERATURES: October 1980 to April 1983 (discontinued).

INSTRUMENTATION.--Water-quality minimonitor since October 1980.

REMARKS.--Letter K indicates non-ideal colony count. Extremes are published for years with 80 percent or more daily record. Malfunctions of the monitor resulted in less than 80 percent recorded daily record for the current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
19...	1200	2400	460	466	8.1	8.3	3.0	8.0	20	741	10.6
DEC											
14...	1500	628	410	428	7.8	7.8	-5.0	.5	4.8	736	11.2
FEB											
08...	1445	1020	360	364	--	7.7	-12.0	.5	4.5	740	12.0
APR											
05...	1345	4060	358	352	8.1	8.0	10.0	.5	95	750	12.8
JUN											
08...	1045	1250	520	411	8.2	8.3	15.0	17.0	8.5	736	6.6
JUL											
26...	1430	1260	400	396	8.4	7.8	29.0	25.0	30	739	7.5

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
OCT											
19...	92	K48	150	58	21	5.3	3.5	167	62	4.9	.10
DEC											
14...	81	26	77	55	20	5.2	2.9	203	36	3.3	.10
FEB											
08...	86	35	>200	50	17	4.5	2.6	188	11	2.7	<.10
APR											
05...	90	K50	3300	45	16	3.6	4.0	127	48	5.3	.10
JUN											
08...	71	K24	200	51	19	5.8	2.9	183	42	3.3	.20
JUL											
26...	94	96	K500	51	19	4.2	2.6	186	32	3.2	.20

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 19...	7.2	314	.330	.030	.70	.050	.050	.020	50	324	90
DEC 14...	4.5	293	.130	.100	1.3	.040	.010	.010	--	--	--
FEB 08...	3.1	237	--	--	--	--	--	--	18	50	80
APR 05...	7.9	210	.590	.080	1.0	.230	.050	.020	246	2700	87
JUN 08...	2.3	265	<.100	<.010	.70	.040	.020	<.010	21	71	95
JUL 26...	9.7	292	<.100	<.010	1.0	.060	.050	<.010	63	214	96

DATE	TIME	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA) (01007)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD) (01027)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR) (01034)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, TOTAL RECOV-ERABLE (UG/L AS CO) (01037)
OCT 19...	1200	--	5	1	100	58	--	1	<1	10	10	2
FEB 08...	1445	<10	--	3	--	75	<1	--	2	--	--	--
APR 05...	1345	<10	--	3	--	50	1	--	1	--	<1	--
JUL 26...	1430	10	--	3	--	58	<0	--	<1	--	<1	--

DATE	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU) (01042)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE) (01045)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN) (01055)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG) (71900)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)
OCT 19...	<1	4	3	450	20	1	1	--	60	9	.1	<.1
FEB 08...	<3	--	1	--	15	--	1	8	--	9	--	.3
APR 05...	3	--	2	--	58	--	5	37	--	44	--	.1
JUL 26...	<3	--	5	--	21	--	4	8	--	15	--	<.1

DATE	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, TOTAL RECOV-ERABLE (UG/L AS NI) (01067)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, TOTAL (UG/L AS SE) (01147)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG) (01077)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN) (01092)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
OCT 19...	--	4	3	<1	<1	<1	<1	--	--	50	10
FEB 08...	<10	--	1	--	<1	--	<1	99	<6	--	16
APR 05...	10	--	3	--	<1	--	<1	93	6	--	3
JUL 26...	<10	--	5	--	<1	--	<1	110	<6	--	4

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	---	---	---						
2	---	---	---	438	434	436						
3	---	---	---	434	428	431						
4	---	---	---	428	422	425						
5	---	---	---	423	419	422						
6	---	---	---	419	415	417						
7	---	---	---	416	409	412						
8	---	---	---	---	---	---						
9	---	---	---	---	---	---						
10	---	---	---	---	---	---						
11	---	---	---	---	---	---						
12	---	---	---	---	---	---						
13	---	---	---	---	---	---						
14	---	---	---	414	411	412						
15	---	---	---	422	414	417						
16	---	---	---	443	423	434						
17	---	---	---	451	444	447						
18	---	---	---	457	445	450						
19	---	---	---	444	414	427						
20	452	441	446	415	401	406						
21	441	435	437	404	398	401						
22	436	432	434	409	403	405						
23	435	430	433	423	410	418						
24	431	429	430	434	422	426						
25	430	428	429	451	435	445						
26	429	426	428	481	452	469						
27	429	426	427	481	457	469						
28	432	429	430	464	449	455						
29	432	429	430	462	436	449						
30	432	429	430	---	---	---						
31	434	432	433	---	---	---						

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	344	342	343	363	360	361			
2	---	---	---	346	343	344	412	359	387			
3	---	---	---	346	344	345	386	348	360			
4	---	---	---	344	342	343	384	350	369			
5	---	---	---	343	339	342	---	---	---			
6	---	---	---	339	331	335	---	---	---			
7	---	---	---	334	329	331	---	---	---			
8	---	---	---	332	329	331	---	---	---			
9	360	357	359	328	326	327	---	---	---			
10	362	356	357	331	328	329	---	---	---			
11	357	356	357	336	332	334	---	---	---			
12	358	356	357	344	336	338	---	---	---			
13	357	356	356	352	345	349	---	---	---			
14	356	354	355	353	352	353	---	---	---			
15	355	354	354	355	353	354	---	---	---			
16	357	354	356	355	354	355	---	---	---			
17	349	345	347	356	355	355	---	---	---			
18	346	345	345	357	355	356	---	---	---			
19	348	345	347	353	351	352	---	---	---			
20	348	347	347	355	353	354	---	---	---			
21	349	347	348	357	354	355	---	---	---			
22	351	348	350	359	356	358	---	---	---			
23	351	350	350	362	359	360	---	---	---			
24	350	347	348	364	362	363	---	---	---			
25	347	346	347	366	364	365	---	---	---			
26	349	346	347	369	366	368	---	---	---			
27	344	342	343	370	369	370	---	---	---			
28	344	342	343	370	369	369	---	---	---			
29	---	---	---	365	364	364	---	---	---			
30	---	---	---	365	364	365	---	---	---			
31	---	---	---	365	362	364	---	---	---			
MONTH	---	---	---	370	326	351	---	---	---			

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	---	---	---						
2	---	---	---	---	---	---						
3	---	---	---	---	---	---						
4	---	---	---	---	---	---						
5	---	---	---	1.0	.0	.5						
6	---	---	---	.0	.0	.0						
7	---	---	---	.5	.0	.5						
8	---	---	---	1.0	.5	1.0						
9	---	---	---	1.0	.5	.5						
10	---	---	---	.5	.5	.5						
11	---	---	---	.5	.5	.5						
12	---	---	---	.5	.0	.0						
13	---	---	---	.0	.0	.0						
14	---	---	---	.0	.0	.0						
15	---	---	---	.0	.0	.0						
16	---	---	---	.0	.0	.0						
17	---	---	---	.0	.0	.0						
18	---	---	---	.0	.0	.0						
19	---	---	---	.0	.0	.0						
20	6.5	5.0	6.0	.0	.0	.0						
21	---	---	---	.0	.0	.0						
22	---	---	---	.0	.0	.0						
23	---	---	---	.0	.0	.0						
24	7.0	5.0	6.0	.0	.0	.0						
25	7.0	5.5	6.0	.0	.0	.0						
26	8.0	7.0	7.0	.0	.0	.0						
27	8.0	7.0	7.5	.0	.0	.0						
28	8.0	7.0	7.5	.0	.0	.0						
29	8.0	7.0	7.5	.0	.0	.0						
30	8.0	5.5	6.0	.0	.0	.0						
31	6.5	5.0	5.5	---	---	---						

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	---	---	---	.0	.0	.0	.0	.0	.0			
2	---	---	---	.0	.0	.0	.0	.0	.0			
3	---	---	---	.0	.0	.0	.5	.0	.0			
4	---	---	---	.0	.0	.0	.5	.0	.0			
5	---	---	---	.0	.0	.0	---	---	---			
6	---	---	---	.0	.0	.0	---	---	---			
7	---	---	---	.0	.0	.0	---	---	---			
8	.0	.0	.0	.0	.0	.0	---	---	---			
9	.0	.0	.0	.0	.0	.0	---	---	---			
10	.5	.0	.0	.0	.0	.0	---	---	---			
11	.0	.0	.0	.0	.0	.0	---	---	---			
12	.0	.0	.0	.0	.0	.0	---	---	---			
13	.0	.0	.0	.0	.0	.0	---	---	---			
14	.0	.0	.0	.0	.0	.0	---	---	---			
15	.0	.0	.0	.0	.0	.0	---	---	---			
16	.0	.0	.0	.0	.0	.0	---	---	---			
17	.0	.0	.0	.0	.0	.0	---	---	---			
18	.0	.0	.0	.0	.0	.0	---	---	---			
19	.0	.0	.0	.5	.0	.0	---	---	---			
20	.0	.0	.0	.0	.0	.0	---	---	---			
21	.0	.0	.0	.5	.0	.0	---	---	---			
22	.0	.0	.0	.5	.0	.0	---	---	---			
23	.0	.0	.0	.5	.0	.0	---	---	---			
24	.0	.0	.0	.5	.0	.0	---	---	---			
25	.0	.0	.0	.5	.0	.0	---	---	---			
26	.0	.0	.0	.5	.0	.0	---	---	---			
27	.0	.0	.0	.5	.0	.0	---	---	---			
28	.0	.0	.0	.5	.0	.0	---	---	---			
29	---	---	---	.0	.0	.0	---	---	---			
30	---	---	---	.5	.0	.0	---	---	---			
31	---	---	---	.5	.0	.0	---	---	---			
MONTH	---	---	---	.5	.0	.0	---	---	---			

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND

LOCATION.--Lat 47°56'34", long 97°03'10", in SW¼NE¼ sec.33, T.152 N., R.50 W., Grand Forks County, Hydrologic Unit 09020301, on left bank on second floor of old sewage plant in Grand Forks, 2.3 mi (3.7 km) downstream from Red Lake River, and at mile 295.7 (475.8 km).

DRAINAGE AREA.--30,100 mi^2 (78,000 km^2), approximately, including 3,800 mi^2 (9,840 km^2) in closed basins.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1882 to current year. Monthly discharge only prior to May 1901, published in WSP 1308.

REVISED RECORDS.--WSP 855: 1936(M). WSP 1115: 1942. WSP 1175: 1897(M). WSP 1388: 1904, 1914-15, 1917-19, 1921-22, 1927, 1950. WSP 1728: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 778.35 ft (237.241 m) National Geodetic Vertical Datum of 1929. Nov. 3, 1933, to Apr. 13, 1965, water-stage recorder 0.3 mi (0.5 km) upstream at present datum. See WSP 1728 or 1913 for history of changes prior to Nov. 3, 1933.

REMARKS. Records good.

AVERAGE DISCHARGE.--101 years, 2,559 ft^3/s (72.44 m^3/s) 1,853,000 acre-ft/yr (2.28 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, about 85,000 ft^3/s (2,410 m^3/s) Apr. 10, 1897, gage height, 50.2 ft (15.30 m), site and datum then in use, from rating curve extended above 54,000 ft^3/s (1,530 m^3/s); minimum, 1.8 ft^3/s (0.051 m^3/s) Sept. 2, 1977, caused by unusual regulation during repair of dam at Grand Forks.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 14,300 ft^3/s (405 m^3/s) Apr. 6, gage height, 29.17 ft (8.891 m); minimum daily, 1,270 ft^3/s (36.0 m^3/s) Feb. 24-25.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1300	3320	1980	1470	1570	1370	9150	3550	2310	6960	2860	3650
2	1370	3240	2080	1470	1590	1380	10100	3370	2310	6770	2710	3150
3	1420	3180	2140	1520	1600	1440	11200	3250	2280	6520	2530	2750
4	1440	3100	2260	1530	1600	1560	12500	3140	2170	7140	2440	2430
5	1430	3010	2530	1520	1600	1980	13600	2990	2080	9900	2400	2260
6	1590	2920	2760	1560	1560	3770	14200	2900	2150	11300	2290	2130
7	1770	2850	2840	1590	1500	8400	13600	2890	2110	11800	2180	2080
8	1720	2760	2700	1650	1510	10700	12400	2800	2060	11500	2140	2020
9	1940	2760	2430	1660	1490	13200	10300	2660	2040	10500	1940	1930
10	2570	2800	2100	1690	1460	13800	8620	2610	1940	9150	1860	1890
11	3310	2800	1800	1700	1460	12100	7320	2670	1840	8130	1760	1920
12	4980	2770	1680	1720	1500	11900	6500	2820	1750	7300	1650	1900
13	6250	2200	1740	1710	1510	9560	5990	2860	2200	6520	1570	1930
14	6640	1800	1780	1700	1530	8770	5600	3000	5700	5840	1530	1920
15	6570	1700	1800	1650	1550	8590	5300	3340	8600	5310	1490	1970
16	6220	1730	1810	1610	1580	8700	5130	3640	8700	4850	1430	2060
17	5770	1880	1760	1660	1600	8940	5060	3700	6640	4360	1390	2410
18	5350	2040	1720	1660	1600	9120	5000	3660	5660	3940	1370	3230
19	5000	2270	1740	1630	1550	9120	4940	3440	4980	3610	1420	3710
20	4700	2660	1740	1620	1450	8900	4830	3300	4270	3540	1390	4060
21	4500	2450	1720	1600	1350	8560	4740	3180	3730	3710	1420	3970
22	4410	2110	1690	1590	1290	8180	4600	3060	3730	3970	1420	3530
23	4330	2010	1670	1590	1280	7880	4440	3000	5440	4100	2600	3050
24	4190	1760	1670	1610	1270	7680	4260	2930	9250	4120	3720	2650
25	3980	1560	1670	1610	1270	7520	4000	2860	11600	4110	3960	2430
26	3840	1540	1620	1580	1280	7500	3760	2790	12000	4100	4270	2190
27	3690	1680	1560	1580	1340	7410	3660	2650	10200	4030	4540	2050
28	3610	1780	1560	1540	1360	7340	3590	2550	8620	3820	5470	1860
29	3550	1820	1550	1500	---	7420	3500	2430	7550	3580	5820	1770
30	3460	1900	1540	1530	---	7650	3520	2420	7180	3310	5160	1680
31	3390	---	1540	1550	---	8120	---	2340	---	3070	4300	---
TOTAL	114290	70400	59180	49600	41250	238560	211410	92800	151090	186860	81030	74580
MEAN	3687	2347	1909	1600	1473	7695	7047	2994	5036	6028	2614	2486
MAX	6640	3320	2840	1720	1600	13800	14200	3700	12000	11800	5820	4060
MIN	1300	1540	1540	1470	1270	1370	3500	2340	1750	3070	1370	1680
AC-FT	226700	139600	117400	98380	81820	473200	419300	184100	299700	370600	160700	147900

CAL YR 1982 TOTAL 1388110 MEAN 3803 MAX 23900 MIN 990 AC-FT 2753000
WTR YR 1983 TOTAL 1371050 MEAN 3756 MAX 14200 MIN 1270 AC-FT 2719000

BEST COPY AVAILABLE

05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1949 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE, FET-LAB (MG/L AS HCO3) (95440)
MAR											
25...	1300	7540	528	7.8	3.5	.0	45	21	24	10	220
25...	1301	7540	528	7.8	3.5	.0	50	21	25	11	--

DATE	CAR-BONATE, FET-LAB (MG/L AS CO3) (95445)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N) (00618)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)
MAR											
25...	.00	180	70	9.3	.10	14	319	1.13	--	--	3
25...	--	176	74	10	.20	15	294	--	1.30	.140	3

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
MAR										
25...	0	20	50	1	50	.2	2	0	160	--
25...	60	28	47	<1	43	<.1	2	<1	160	11

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05087500 MIDDLE RIVER AT ARGYLE, MN

LOCATION.--Lat 48°20'25", long 96°48'58", in NE¼NW¼ sec.15, T.156 N., R.48 W., Marshall County, Hydrologic Unit 09020309, on left bank 30 ft (9 m) upstream of bridge on County Highway 4 in Argyle and 14 mi (22 km) upstream from mouth.

DRAINAGE AREA.--265 mi^2 (686 km^2).

PERIOD OF RECORD.--March to September 1945, October 1950 to September 1981. Monthly discharge only for some periods, published in WSP 1728. October 1981 to January 1982, operated as a high-flow partial-record station. February 1982 to current year.

GAGE.--Water-stage recorder. Datum of gage is 828.53 ft (252.536 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 8, 1951, nonrecording gage and Nov. 8, 1951, to Sept. 18, 1952, water-stage recorder at site 800 ft (240 m) downstream at datum 1.0 ft (0.30 m) higher. Sept. 19, 1952, to June 28, 1982, recording gage at site 800 feet (240 m) downstream at present datum. June 29, 1982, to Sept. 20, 1983, nonrecording gage at present site and datum.

REMARKS.--Records fair.

AVERAGE DISCHARGE.--32 years (water years 1951-81, 1983), 41.7 ft^3/s (1.181 m^3/s), 30,210 acre-ft/yr (37.2 hm^3/yr); median of yearly mean discharges, 38 ft^3/s (1.08 m^3/s), 27,500 acre-ft/yr (34 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,260 ft^3/s (121 m^3/s) July 3, 1975, gage height, 16.59 ft (5.057 m) present datum, site then in use; no flow at times in most years.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1950 reached a stage of 15.25 ft (4.648 m) present datum, site then in use, from floodmarks, discharge, 2,790 ft^3/s (79.0 m^3/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,020 ft^3/s (28.9 m^3/s) Mar. 9, gage height, 14.17 ft (4.319 m) (backwater from ice); minimum daily, 0.04 ft^3/s (0.001 m^3/s) Sept. 12, 13, 29.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.61	44	15	5.9	3.7	3.1	130	60	21	44	3.9	.28
2	1.1	41	16	5.8	3.7	3.1	200	58	18	41	3.1	.24
3	1.3	40	18	5.7	3.6	3.3	300	57	16	41	2.8	.27
4	1.1	37	25	5.6	3.6	4.0	400	53	14	42	2.7	.23
5	.91	35	40	5.5	3.5	6.0	450	49	13	42	2.2	.21
6	3.2	33	40	5.4	3.5	35	445	42	13	45	2.0	.18
7	3.8	33	35	5.3	3.5	200	361	37	11	45	1.5	.15
8	21	31	30	5.2	3.4	500	298	39	10	40	1.4	.10
9	57	30	27	5.1	3.4	950	234	40	10	37	1.1	.09
10	82	28	24	5.0	3.4	700	193	34	10	28	1.1	.09
11	155	27	21	4.9	3.4	550	172	28	9.1	25	.87	.08
12	212	26	19	4.8	3.3	500	158	38	8.2	21	.67	.04
13	252	24	17	4.8	3.3	450	142	48	9.9	18	.38	.04
14	260	22	15	4.7	3.3	400	130	99	14	16	.34	.06
15	248	21	14	4.6	3.3	330	112	145	15	12	.28	.72
16	228	20	13	4.5	3.3	290	91	140	42	11	.23	.61
17	192	19	12	4.5	3.2	245	79	135	54	11	.22	.41
18	164	18	11	4.4	3.2	210	73	99	61	9.9	.18	1.6
19	140	17	10	4.4	3.2	180	63	79	51	9.1	.15	.91
20	121	17	9.5	4.3	3.2	160	60	69	42	9.1	.13	.55
21	112	17	9.0	4.2	3.2	150	67	61	40	8.6	.43	.53
22	99	17	8.5	4.2	3.1	130	65	51	81	8.2	1.0	.43
23	90	17	8.0	4.1	3.1	110	60	46	127	7.3	.55	.32
24	75	16	7.6	4.1	3.1	100	56	41	196	6.5	.53	.26
25	69	16	7.2	4.0	3.1	90	53	37	278	5.8	.38	.27
26	63	16	7.0	4.0	3.1	80	52	32	252	5.7	.36	.21
27	58	15	6.8	3.9	3.1	70	51	32	180	5.1	.34	.21
28	59	15	6.6	3.9	3.1	60	55	32	122	4.4	.43	.12
29	53	15	6.4	3.8	---	60	59	28	71	3.9	.72	.04
30	48	14	6.2	3.8	---	70	62	25	50	4.1	.58	.13
31	46	---	6.0	3.7	---	90	---	23	---	4.4	.41	---
TOTAL	2916.02	721	490.8	144.1	92.9	6729.5	4671	1757	1839.2	611.1	30.98	9.38
MEAN	94.1	24.0	15.8	4.65	3.32	217	156	56.7	61.3	19.7	1.00	.31
MAX	260	44	40	5.9	3.7	950	450	145	278	45	3.9	1.6
MIN	.61	14	6.0	3.7	3.1	3.1	51	23	8.2	3.9	.13	.04
CFSM	.36	.09	.06	.02	.01	.82	.59	.21	.23	.07	.004	.001
IN.	.41	.10	.07	.02	.01	.94	.66	.25	.26	.09	.00	.00
AC-FT	5780	1430	974	286	184	13350	9260	3490	3650	1210	61	19

WTR YR 1983 TOTAL 20012.98 MEAN 54.8 MAX 950 MIN .04 CFSM .21 IN 2.81 AC-FT 39700

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05092000 RED RIVER OF THE NORTH AT DRAYTON, ND

LOCATION.--Lat 48°34'20", long 97°08'50", in SE¼SE¼SE¼ sec.24, T.159 N., R.51 W., Pembina County, Hydrologic Unit 09020311, on downstream end of east pier of interstate highway bridge, 1.5 mi (2.4 km) northeast of Drayton, and at mile 206.7 (332.6 km).

DRAINAGE AREA.--34,800 mi^2 (90,130 km^2), approximately, includes 3,800 mi^2 (9,840 km^2) in closed basins.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1936 to June 1937, April 1941 to current year (fragmentary prior to April 1949).

REVISED RECORDS.--WSP 1388: 1949-50. WSP 1728: Drainage area.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 755.00 ft (230.124 m) National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation benchmark). Prior to Nov. 30, 1954, nonrecording gage at site 1.5 mi (2.4 km) upstream at datum 1.59 ft (0.485 m) higher.

REMARKS.--Records good. Some regulation by reservoirs on tributaries.

AVERAGE DISCHARGE.--34 years (1949-83), 3,797 ft^3/s (107.5 m^3/s), 2,751,000 acre-ft/yr (3.39 km^3/yr); median of yearly mean discharges, 2,770 ft^3/s (78.4 m^3/s), 2,007,000 acre-ft/yr (2.5 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 92,900 ft^3/s (2,630 m^3/s) Apr. 28, 1979, gage height, 43.66 ft (13.308 m); minimum observed, 7.7 ft^3/s (0.22 m^3/s) Oct. 16, 1936, gage height, 1.75 ft (0.533 m), former site and datum.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1897 reached a stage of about 41 ft (12.5 m), at site and datum in use prior to Nov. 30, 1954.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 21,300 ft^3/s (603 m^3/s) Apr. 9, gage height, 30.88 ft (9.412 m); minimum daily, 1,250 ft^3/s (35.4 m^3/s) Oct. 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1250	3760	1980	1590	1570	1320	11000	3800	2600	8500	3460	5780
2	1260	3640	2160	1550	1550	1370	11500	3800	2510	7950	3200	4840
3	1260	3540	2340	1490	1550	1400	12000	3750	2500	7400	3030	4040
4	1290	3440	2480	1490	1550	1440	12800	3650	2500	7200	2930	3460
5	1330	3320	2590	1520	1530	1610	14200	3480	2460	7350	2690	3010
6	1380	3240	2710	1530	1530	2690	17100	3340	2410	8500	2600	2710
7	1530	3160	2970	1540	1530	5720	19800	3200	2360	9500	2480	2480
8	1760	3090	3220	1550	1530	8120	21000	3160	2260	11100	2380	2270
9	1920	2950	3220	1610	1530	9530	21300	3070	2190	11400	2240	2230
10	2190	2930	3030	1650	1520	11000	20800	2950	2120	11100	2080	2100
11	3030	2930	2660	1650	1510	11800	19800	2860	2060	10200	2000	2040
12	4080	2690	2310	1650	1490	12600	18400	2880	2000	9480	1880	2000
13	6000	2120	2040	1670	1490	12700	16900	2950	1960	8600	1750	2000
14	7710	1940	1880	1710	1510	12800	15100	3030	2090	7630	1670	1980
15	8260	1690	1850	1690	1510	12700	13200	3180	3730	6780	1590	2020
16	8200	1610	1850	1670	1520	12700	11000	3620	5810	5900	1570	2060
17	7900	1710	1870	1660	1520	12700	9020	4080	8510	5200	1520	2100
18	7400	1850	1870	1660	1530	12500	7200	4280	7700	4580	1460	2500
19	6810	1980	1850	1660	1530	12100	6240	4220	6500	4300	1430	3140
20	6190	2180	1830	1660	1510	12000	5620	4080	5420	4000	1430	3840
21	5690	2180	1810	1640	1460	11900	5220	3840	4720	3900	1460	4380
22	5310	2130	1810	1610	1430	11700	5000	3660	4220	3920	1520	4520
23	5100	2200	1810	1610	1370	11400	4880	3520	4000	4160	1660	4220
24	5000	2160	1780	1580	1300	11200	4650	3380	5920	4360	2210	3640
25	4860	2050	1720	1590	1260	11000	4520	3360	9800	4480	3640	3160
26	4750	1980	1700	1600	1270	10700	4280	3280	11200	4500	4440	2780
27	4580	1800	1700	1600	1290	10600	4100	3160	11800	4500	5020	2510
28	4320	1740	1660	1610	1300	10400	4000	2990	11800	4480	5520	2260
29	4160	1800	1630	1610	---	10400	3900	2900	10900	4280	6460	2230
30	4020	1910	1600	1590	---	10400	3820	2820	9600	4040	7260	1940
31	3880	---	1590	1570	---	10700	---	2730	---	3760	6880	---
TOTAL	132420	73720	65520	49810	41190	289200	328350	105020	153650	203050	89460	88240
MEAN	4272	2457	2114	1607	1471	9329	10950	3388	5122	6550	2886	2941
MAX	8260	3760	3220	1710	1570	12800	21300	4280	11800	11400	7260	5780
MIN	1250	1610	1590	1490	1260	1320	3820	2730	1960	3760	1430	1940
AC-FT	262700	146200	130000	98800	81700	573600	651300	208300	304800	402700	177400	175000

CAL YR 1982 TOTAL 1698924 MEAN 4655 MAX 35400 MIN 912 AC-FT 3370000
WTR YR 1983 TOTAL 1619630 MEAN 4437 MAX 21300 MIN 1250 AC-FT 3213000

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05092000 RED RIVER OF THE NORTH AT DRAYTON, ND--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1972 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)
OCT						
20...	1300	6190	735	--	5.0	7.5
DEC						
15...	1325	1840	920	--	-4.0	.0
JAN						
12...	1230	1750	680	--	-6.0	.0
FEB						
16...	1330	1520	472	--	.0	.0
APR						
08...	1455	20900	410	--	6.5	.5
09...	1230	21300	416	--	12.0	.5
19...	1145	6250	554	8.1	10.5	5.5
MAY						
16...	1300	3650	770	--	13.0	11.0
JUN						
17...	1220	8520	600	--	22.0	22.0
28...	1300	11800	468	--	26.0	25.0
JUL						
08...	1110	11100	400	--	28.0	22.0
15...	1350	6770	561	--	32.0	27.0
AUG						
04...	1110	1590	580	--	24.5	24.0

DATE	TIME	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)
APR					
19...	1145	52	22	28	7.6

DATE	BICAR-BONATE, FET-LAB (MG/L AS HCO3) (95440)	CAR-BONATE, FET-LAB (MG/L AS CO3) (95445)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N) (00618)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)
APR										
19...	230	.00	190	71	28	.10	10	321	.226	1

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
APR									
19...	60	28	30	0	0	.2	2	0	110

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA
(International gaging station)

LOCATION.--Lat 49°00'30", long 97°12'40", in sec.2, T.1, R.2 E., on right bank 1,500 ft (457 m) downstream from Canadian National Railway bridge in Emerson, 0.8 mi (1.3 km) downstream from international boundary, 3.6 mi (5.8 km) downstream from Pembina River, and at mile 154.3 (248.3 km).

DRAINAGE AREA.--40,200 mi^2 (104,100 km^2), approximately, includes 3,800 mi^2 (9,840 km^2) in closed basins.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--March to November 1902 (gage heights only), May 1912 to September 1929 (monthly discharge only, published in WSP 1308). October 1929 to current year.

GAGE.--Water-stage recorder. Datum of gage is 700.00 ft (213.360 m) National Geodetic Vertical Datum of 1929, by Geodetic Survey of Canada. See WSP 1728 or 1913 for history of changes prior to Apr. 10, 1953.

REMARKS.--Records good. Discharge partialy regulated by reservoirs on tributaries.

COOPERATION.--This station is one of the international gaging stations maintained by Canada under agreement with the United States.

AVERAGE DISCHARGE.--70 years (water years 1913-82), 3,313 ft^3/s (93.82 m^3/s), 2,400,000 acre-ft/yr (2.96 km^3/yr); median of yearly mean discharges, 2,760 ft^3/s (78.2 m^3/s), 1,910,000 acre-ft/yr (2.4 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 95,500 ft^3/s (2,700 m^3/s) May 13, 1950, gage height, 90.89 ft (27.703 m); maximum gage height, 91.19 ft (27.795 m) May 1, 1979; minimum observed discharge, 0.9 ft^3/s (0.025 m^3/s) Feb. 6-8, 1937.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 24,600 ft^3/s (697 m^3/s) Apr. 9, minimum daily, 1,180 ft^3/s (33.4 m^3/s) Feb. 27, 28.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1360	3700	1900	1540	1510	1180	11300	4700	3090	9460	3340	5010
2	1400	3620	1920	1510	1500	1200	11800	4590	2990	8760	3140	4550
3	1400	3540	1960	1500	1480	1230	12400	4520	2940	8230	2980	4060
4	1410	3440	2020	1480	1480	1260	13000	4410	2910	7840	2900	3600
5	1430	3330	2120	1460	1470	1340	14000	4270	2870	7520	2770	3200
6	1490	3210	2210	1470	1470	2180	15600	4170	2820	7630	2620	2880
7	1640	3160	2330	1490	1450	4800	18700	4030	2760	8370	2510	2640
8	1970	3110	2470	1510	1450	6070	21900	3880	2670	9290	2430	2450
9	2450	3010	2590	1550	1430	7560	24600	3740	2580	9920	2350	2330
10	1690	2960	2620	1600	1400	9460	24500	3600	2500	10200	2240	2220
11	3330	2770	2620	1650	1380	11200	23400	3510	2420	10000	2130	2130
12	4360	2480	2480	1700	1360	12300	21600	3450	2350	9570	2040	2050
13	5350	2110	2260	1730	1350	13200	19400	3460	2300	8930	1940	2000
14	6590	2150	2020	1750	1340	13700	17400	3500	2260	8160	1840	1980
15	7820	2190	1840	1770	1340	13700	15400	3670	2390	7380	1740	2010
16	8080	2130	1770	1780	1350	13700	13400	3920	4030	6600	1660	2040
17	8110	2070	1730	1760	1360	13600	11500	4200	6110	5860	1620	2070
18	7890	2030	1720	1720	1380	13300	9850	4450	7030	5230	1570	2100
19	7290	2000	1720	1690	1400	13000	8500	4590	6960	4630	1540	2260
20	6710	2010	1700	1680	1420	12800	7700	4550	6460	4200	1470	2640
21	6170	2050	1680	1670	1420	12500	7170	4450	5830	3810	1460	3110
22	5700	2130	1680	1650	1390	12300	6890	4270	5260	3570	1480	3480
23	5340	2200	1680	1630	1350	11900	6670	4100	4770	3500	1530	3640
24	5090	2240	1670	1610	1290	11600	6390	3920	4590	3570	1630	3500
25	4890	2260	1660	1610	1240	11300	6110	3810	5680	3710	2090	3230
26	4700	2230	1650	1590	1200	11000	5860	3710	7910	3740	2910	2950
27	4490	2140	1630	1600	1180	10700	5580	3600	9570	3780	3490	2700
28	4290	2010	1610	1600	1180	10500	5330	3500	10400	3780	3890	2500
29	4100	1900	1600	1600	---	10400	5080	3370	10500	3740	4270	2320
30	3940	1870	1570	1590	---	10500	4870	3280	10100	3670	4800	2160
31	3810	---	1560	1550	---	10700	---	3180	---	3530	5120	---
TOTAL	134290	76050	59990	50040	38570	290180	375900	122400	145050	198180	77500	83810
MEAN	4332	2535	1935	1614	1378	9361	12530	3948	4835	6393	2500	2794
MAX	8110	3700	2620	1780	1510	13700	24600	4700	10500	10200	5120	5010
MIN	1360	1870	1560	1460	1180	1180	4870	3180	2260	3500	1460	1980
AC-FT	266400	150800	119000	99250	76500	575600	745600	242800	287700	393100	153700	166200

CAL YR 1982 TOTAL 1698510 MEAN 4753 MAX 34000 MIN 975 AC-FT 3369000
WTR YR 1983 TOTAL 1651960 MEAN 4526 MAX 24600 MIN 1180 AC-FT 3277000

BEST COPY AVAILABLE

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued
(National stream-quality accounting network station)
(Pesticide station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1978 to current year.

REMARKS.--Letter K indicates non-ideal colony count and letter E indicates estimated value.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
OCT										
14...	1000	E3670	E513	8.2	--	9.0	--	10.0	--	90
NOV										
22...	1120	E2800	680	8.1	-15.0	1.0	10	14.0	100	K10
JAN										
13...	1315	1770	685	8.2	-2.0	.0	5.1	--	--	K10
MAR										
09...	1810	E20000	435	7.7	-5.5	.0	2.7	--	--	K400
APR										
27...	1210	5470	558	8.2	9.0	11.0	140	6.9	65	--

DATE	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT					
14...	--	50	--	--	--
NOV					
22...	K68	63	19	--	100
JAN					
13...	--	67	9	43	99
MAR					
09...	K200	40	--	--	--
APR					
27...	--	51	--	--	--

BEST COPY AVAILABLE

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	ALDRIN, TOTAL (UG/L) (39330)	CHLORDANE, TOTAL (UG/L) (39350)	DDD, TOTAL (UG/L) (39360)	DDT, TOTAL (UG/L) (39370)	DIELDRIN TOTAL (UG/L) (39380)	ENDOSULFAN, TOTAL (UG/L) (39388)	ENDRIN, TOTAL (UG/L) (39390)
OCT 14...	1000	.000	.0	.000	.000	.000	.000	.000

DATE	HEPTACHLOR, TOTAL (UG/L) (39410)	HEPTACHLOR EPOXIDE TOTAL (UG/L) (39420)	LINDANE TOTAL (UG/L) (39340)	MIREX, TOTAL (UG/L) (39755)	2,4-D, TOTAL (UG/L) (39730)	2,4,5-T TOTAL (UG/L) (39740)
OCT 14...	.000	.000	.000	.00	.01	.00

DATE	TIME	STREAMFLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)
JUN 29...	1105	10300	439	7.8	20.5	23.0	160
AUG 17...	0925	1770	582	8.2	23.0	22.5	45

DATE	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)
JUN 29...	4.2	51	210	1400	48	--	--
AUG 17...	7.1	85	K7	47	60	104	497

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05104500 ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN

LOCATION.--Lat 48°47'30", long 95°44'40", in NW¼SW¼ sec.6, T.161 N., R.39 W., Roseau County, Hydrologic Unit 09020314, on left bank 0.3 mi (0.5 km) downstream from South Fork and 1.5 mi (2.4 km) northwest of Malung.

DRAINAGE AREA.--573 mi^2 (1,484 km^2).

PERIOD OF RECORD.--October 1946 to current year.

REVISED RECORDS.--WSP 2113: 1948, 1950, 1951, 1956(M), 1957(M), 1962(M).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,029.67 ft (313.843 m), adjustment of 1912.

REMARKS.--Records good except those for the winter period, which are poor. Some flow bypasses the gaging station through a natural overflow channel 0.8 mi (1.3 km) upstream and returns to river 0.5 mi (0.8 km) downstream. Overflow begins at stage of about 13.0 ft (4.0 m), discharge, 1,800 ft^3/s (51.0 m^3/s). These records include any flow in the overflow channel.

AVERAGE DISCHARGE.--37 years, 143 ft^3/s (4.050 m^3/s), 103,600 acre-ft/yr (128 hm^3/yr); median of yearly mean discharges, 114 ft^3/s (3.23 m^3/s), 82,600 acre-ft/yr (102 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,750 ft^3/s (163 m^3/s) July 18, 1968, gage height, 22.32 ft (6.803 m); maximum gage height, 23.37 ft (7.123 m) Apr. 3, 1966 (backwater from ice); no flow for part of Jan. 15, 1952 (caused by construction of concrete control), July 23 to Sept. 8, 1961, Dec. 22 to Mar. 10, 1977, and Sept. 9-11, 1980.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 912 ft^3/s (25.8 m^3/s) June 27, gage height, 9.28 ft (2.829 m); minimum, 2.8 ft^3/s (0.079 m^3/s) Aug. 20, 21, gage height, 4.54 ft (1.384 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	54	181	32	10	7.7	11	200	165	179	302	24	33
2	70	170	34	9.2	7.9	11	300	166	161	285	24	39
3	96	167	40	9.0	7.7	11	500	157	142	282	23	38
4	114	167	50	9.5	7.4	11	700	143	129	296	22	37
5	120	159	60	9.5	7.2	40	700	130	121	321	19	32
6	129	156	70	9.8	6.9	200	700	116	110	336	18	27
7	165	146	65	9.5	6.7	750	650	104	101	317	14	23
8	252	139	55	9.5	6.7	750	600	98	91	274	12	23
9	311	132	45	10	6.5	700	500	91	81	229	11	23
10	391	123	35	11	6.7	660	400	87	74	192	10	18
11	520	119	31	10	6.7	600	339	86	67	159	8.9	27
12	603	99	25	10	6.9	550	302	105	60	132	7.9	23
13	644	76	22	9.8	7.2	600	282	174	64	112	7.1	18
14	662	88	20	9.8	7.4	450	263	296	176	95	6.5	16
15	665	95	20	9.8	7.4	300	240	347	311	82	5.5	18
16	644	78	18	9.5	7.7	200	215	329	459	70	5.0	20
17	599	70	19	9.2	7.7	150	191	291	528	61	4.7	21
18	547	65	18	8.7	7.9	120	170	254	533	54	4.1	32
19	501	65	18	8.5	8.2	100	151	226	469	48	3.9	32
20	471	68	17	8.5	8.5	90	138	212	358	44	3.1	29
21	447	64	15	8.7	8.7	80	128	202	271	40	3.0	30
22	418	60	15	8.7	8.7	70	123	199	251	36	3.8	31
23	383	55	15	9.0	8.7	65	123	199	380	32	5.4	31
24	345	50	15	9.0	8.5	60	119	212	575	28	5.1	32
25	314	45	14	8.7	8.2	55	112	210	724	26	6.8	29
26	287	42	13	8.5	8.5	50	111	200	856	22	8.0	28
27	264	39	13	8.2	9.2	46	116	175	880	21	8.7	25
28	245	37	12	8.2	10	43	127	161	706	22	24	21
29	226	35	11	8.2	---	40	142	156	509	21	28	19
30	210	33	10	8.2	---	45	151	164	365	23	36	16
31	195	---	11	7.9	---	90	---	187	---	24	41	---
TOTAL	10892	2823	838	284.1	217.5	6948	8793	5642	9731	3986	403.5	791
MEAN	351	94.1	27.0	9.16	7.77	224	293	182	324	129	13.0	26.4
MAX	665	181	70	11	10	750	700	347	880	336	41	39
MIN	54	33	10	7.9	6.5	11	111	86	60	21	3.0	6
AC-FT	21600	5600	1660	564	431	13780	17440	11190	19300	7910	800	1570

CAL YR 1982	TOTAL	44213.3	MEAN	121	MAX	1820	MIN 4.0	AC-FT	87700
WTR YR 1983	TOTAL	51349.1	MEAN	141	MAX	880	MIN 3.0	AC-FT	101900

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05105300 ROSEAU RIVER BELOW ROSEAU, MN

LOCATION.--Lat 48°53'28", long 95°43'50", in SW¼SE¼ sec.31, T.163 N., R.39 W., Roseau County, Hydrologic Unit 09020314, at bridge on County Highway 28, 900 ft (274 m) downstream from Hay Creek and 3.2 mi (5.1 km) northeast of Roseau.

PERIOD OF RECORD.--Water years 1973 to current year (discontinued).

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAMFLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE, AIR (DEG C) (00020)	BAROMETRIC PRESSURE (MM OF HG) (00025)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	OXYGEN, DISSOLVED (MG/L) (00300)
OCT											
25...	1530	342	310	314	7.6	7.8	20.0	733	7.0	70	8.8
JAN , 1983											
03...	1545	11	595	587	7.6	7.4	-3.0	731	.0	50	8.8
FEB											
28...	1440	9.0	500	569	7.5	7.7	-2.0	731	.5	25	6.8
APR											
11...	1545	423	225	210	7.7	7.5	12.0	734	1.0	50	9.9
JUN											
14...	1240	170	400	405	8.1	7.9	21.0	730	18.5	65	5.6
AUG											
02...	1330	23	448	420	8.3	8.1	24.0	734	24.0	60	8.0

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)
OCT											
25...	75	K34	170	45	14	3.4	.90	157	14	2.6	.10
JAN											
03...	63	K730	620	77	29	11	1.9	311	22	5.0	.10
FEB											
28...	49	K260	1700	71	27	13	2.3	288	24	9.7	.20
APR											
11...	72	K27	530	28	9.2	2.1	2.6	99	7.4	2.3	<.10
JUN											
14...	63	--	K1800	58	19	5.0	1.4	212	11	2.2	.20
AUG											
02...	99	100	680	58	21	6.8	.90	225	9.8	3.0	.20

DATE	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P) (00671)	BORON, DISSOLVED (UG/L AS B) (01020)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)
OCT										
25...	13	9	<.100	.90	<.010	90	87	24	21	.30
JAN										
03...	20	19	.250	1.2	.010	100	99	90	21	.80
FEB										
28...	19	8	.510	.70	.030	30	62	60	12	--
APR										
11...	6.9	4	<.100	.90	.020	60	200	68	15	.30
JUN										
14...	7.1	8	<.100	.90	.030	90	61	84	20	--
AUG										
02...	9.4	21	<.100	.80	.050	90	26	35	23	.30

BEST COPY AVAILABLE

05106500 ROSEAU RIVER AT ROSEAU LAKE, MN

LOCATION.--Lat 48°54'22", long 95°49'55", in SW¼SW¼ sec.28, T.163 N., R.40 W., Roseau County, Hydrologic Unit 09020314, at downstream side of bridge on County Road 123 at Roseau Lake, 3.5 mi (5.6 km) upstream from Pine Creek, 3.8 mi (6.1 km) downstream from Sprague Creek, and 7 mi (11 km) northwest of Roseau.

PERIOD OF RECORD.--November 1939 to current year (incomplete).

GAGE.--Water-stage recorder. Datum of gage is 1,018.59 ft (310.466 m), adjustment of 1928 (levels by Geodetic Survey of Canada); gage readings have been reduced to elevations adjustment of 1928. Prior to Aug. 26, 1970, and Oct. 18, 1979 to Sept. 30, 1980, nonrecording gage at same site and datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,036.86 ft (316.035 m) May 13, 1950; minimum observed, 1,019.75 ft (310.820 m) Aug. 16, 1941.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in July 1919 reached an elevation of about 1,034 ft (315.2 m).

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,031.03 ft (314.258 m) Mar. 10, from high-water mark; minimum, 1,021.65 ft (311.399 m) part or all of each day Aug. 17-24, 26-28.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22.66	25.64			---	---	28.72	25.51	25.40	27.41	21.89	22.38
2	22.97	25.43			---	---	28.98	25.49	25.15	27.16	21.85	22.28
3	23.32	25.23			---	---	29.27	25.41	24.95	27.44	21.84	22.23
4	23.66	25.08			---	---	29.67	25.23	24.77	27.67	21.82	---
5	23.83	24.90			---	---	30.01	25.00	24.57	27.69	21.80	---
6	23.96	24.71			---	25.25	30.04	24.72	24.32	27.62	21.76	---
7	24.74	24.60			---	30.29	30.05	24.51	24.07	27.49	21.73	---
8	26.11	24.41			---	30.82	30.16	24.28	23.82	27.26	21.71	---
9	26.61	24.21			---	30.89	30.08	24.05	23.58	26.90	21.70	---
10	26.91	---			---	---	29.87	23.94	23.35	26.51	21.69	---
11	27.56	---			---	30.72	29.60	24.15	23.17	26.08	21.69	---
12	28.06	---			---	30.35	29.33	25.16	23.00	25.61	21.68	---
13	28.26	---			---	30.25	29.05	26.88	23.11	25.12	21.67	---
14	28.33	---			---	30.43	28.79	27.63	23.66	24.67	21.67	---
15	28.32	---			---	---	28.54	27.82	24.86	24.24	21.67	---
16	28.21	---			---	---	28.26	27.73	26.19	23.82	21.66	---
17	28.09	---			---	---	27.88	27.48	26.77	23.44	21.67	---
18	28.00	---			---	---	27.52	27.21	26.85	23.05	21.67	---
19	27.94	---			---	---	27.17	27.09	26.69	22.77	21.66	---
20	27.88	---			---	---	26.77	26.96	26.39	22.77	21.66	---
21	27.79	---			---	---	26.40	26.75	26.24	22.74	21.65	---
22	27.69	---			---	---	26.13	26.66	26.69	22.46	21.66	---
23	27.56	---			---	---	25.86	26.60	27.45	22.21	21.66	---
24	27.39	---			---	---	25.67	26.47	27.83	22.05	21.66	---
25	27.11	---			---	---	25.49	26.32	28.03	22.01	21.66	21.94
26	27.06	---			---	28.87	25.44	26.10	28.19	21.99	21.66	21.89
27	26.85	---			---	28.67	25.54	25.88	28.34	21.94	21.66	21.86
28	26.61	---			21.91	28.49	25.52	25.69	28.24	21.92	21.76	21.77
29	26.36	---			---	28.32	25.50	25.58	27.95	21.88	22.11	21.74
30	26.14	---			---	28.22	25.51	25.53	27.70	21.85	22.30	21.73
31	25.90	---			---	28.37	---	25.52	---	21.89	22.37	---
MEAN	26.51	---			---	---	27.89	25.91	25.71	24.44	21.76	---
MAX	28.33	---			---	---	30.16	27.82	28.34	27.69	22.37	---
MIN	22.66	---			---	---	25.44	23.94	23.00	21.85	21.65	---

NOTE: Add 1,000 ft to obtain elevations in adjustment of 1928.

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05107500 ROSEAU RIVER AT ROSS, MN

LOCATION.--Lat 48°54'37", long 95°55'18", in NE¼SE¼ sec.27, T.163 N., R.41 W., Roseau County, Hydrologic Unit 09020314, on left bank 300 ft (91 m) downstream from highway bridge, 0.2 mi (0.3 km) north of Ross, and 2.3 mi (3.7 km) downstream from Pine Creek.

DRAINAGE AREA.--1,220 mi^2 (3,160 km^2), approximately.

PERIOD OF RECORD.--July 1928 to current year.

REVISED RECORDS.--WSP 1055: 1945. WSP 1175: Drainage area. WSP 1308: 1936(M). WSP 1508: 1948-49(P).

GAGE.--Water-stage recorder. Datum of gage is 1,018.44 ft (310.42 m), adjustment of 1928 (levels by Geodetic Survey of Canada). Prior to Mar. 13, 1929, nonrecording gage at same site and datum.

REMARKS.--Records good except those for winter period, which are poor. High flow affected by natural storage in Roseau Lake.

AVERAGE DISCHARGE.--55 years, 262 ft^3/s (7.420 m^3/s), 189,800 acre-ft/yr (234 hm^3/yr); median of yearly mean discharges, 235 ft^3/s (6.66 m^3/s), 170,000 acre-ft/yr (210 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,560 ft^3/s (186 m^3/s) May 12, 1950, gage height, 18.25 ft (5.563 m); no flow Aug. 29, 30, 1961, Jan. 3 to Mar. 3, 1977, Aug. 23-25, 1977 and Aug. 3, 1980.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known, about 19 ft (5.8 m) in 1896. Other outstanding floods reached the following stages, from information by local residents: flood of July 1919, 17.5 ft (5.3 m); flood of 1927, about 16 ft (4.9 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,310 ft^3/s (37.1 m^3/s) Apr. 6, gage height, 11.60 ft (3.536 m) from high-water mark (backwater from ice); minimum, 6.6 ft^3/s (0.19 m^3/s) Aug. 23, 24, gage height, 1.16 ft (0.354 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	66	432	70	18	13	14	400	434	468	815	46	87
2	88	404	72	17	13	14	700	433	436	768	44	77
3	119	385	80	17	13	14	1000	425	406	809	43	67
4	159	367	110	16	13	15	1200	408	383	845	41	61
5	179	346	140	16	13	16	1250	378	356	851	40	56
6	192	325	170	16	12	30	1300	345	328	842	37	52
7	277	314	165	16	12	50	1290	318	297	821	33	45
8	451	297	150	16	12	100	1250	293	267	780	30	39
9	535	274	120	16	12	150	1250	267	240	722	26	36
10	581	252	100	16	12	450	1200	249	218	654	24	34
11	677	232	75	15	12	700	1130	266	200	585	21	30
12	765	216	60	15	12	750	1070	379	190	513	20	29
13	799	211	50	15	12	800	1000	620	185	441	19	30
14	813	190	45	15	13	800	950	762	240	377	17	28
15	806	176	40	15	13	800	900	805	388	317	15	28
16	794	169	37	15	13	750	850	798	585	265	14	29
17	779	156	35	14	13	700	800	765	688	219	13	31
18	766	144	33	14	13	650	750	732	711	180	12	38
19	754	137	32	14	13	600	683	714	688	150	11	44
20	744	130	30	14	13	550	631	691	640	145	9.8	47
21	732	120	29	14	13	500	576	662	617	143	9.0	47
22	715	115	27	14	13	450	534	647	675	121	8.4	45
23	692	110	26	14	13	400	496	635	804	96	7.1	43
24	663	105	25	14	13	360	467	619	868	78	6.9	42
25	634	100	24	13	13	330	440	598	903	63	9.3	41
26	608	95	23	13	13	300	426	568	928	56	13	39
27	585	90	22	13	13	260	437	534	957	51	19	37
28	555	85	21	13	13	220	439	505	946	48	77	34
29	522	80	20	13	---	190	435	491	907	46	88	31
30	491	75	19	13	---	170	435	484	864	45	93	32
31	462	---	18	13	---	250	---	481	---	46	92	---
TOTAL	17003	6132	1868	457	356	11383	24289	16306	16383	11892	938.5	1279
MEAN	548	204	60.3	14.7	12.7	367	810	526	546	384	30.3	42.6
MAX	813	432	170	18	13	800	1300	805	957	851	93	87
MIN	66	75	18	13	12	14	400	249	185	45	6.9	28
CFSM	.45	.17	.05	.01	.01	.30	.66	.43	.45	.32	.03	.04
IN.	.52	.19	.06	.01	.01	.35	.74	.50	.50	.36	.03	.04
AC-FT	33730	12160	3710	906	706	22580	48180	32340	32500	23590	1860	2540

CAL YR 1982	TOTAL	94451.0	MEAN	259	MAX	1840	MIN 7.4	CFSM .21	IN 2.88	AC-FT	187300
WTR YR 1983	TOTAL	108286.5	MEAN	297	MAX	1300	MIN 6.9	CFSM .24	IN 3.30	AC-FT	214800

NOTE:--No gage-height record Mar. 16 to Apr. 11.

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51, NEAR CARIBOU, MN
(International gaging station)

LOCATION.--Lat 48°58'54", long 96°27'46", in SE¼SW¼ sec.34, T.164 N., R.45 W., Kittson County, Hydrologic Unit 09020314, on left bank 400 ft (122 m) downstream from State ditch 51 (known locally as Caribou cutoff ditch) and 0.6 mi (1.0 km) west of Caribou.

DRAINAGE AREA.--1,570 mi^2 (4,070 km^2), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April to October 1917, April 1920 to current year (no winter records in water years 1931, 1932, 1934-36, 1938-40, 1944-72). Published as "at Caribou," prior to April 1929; as "below Cutoff ditch, near Caribou" April 1929 to September 1936. Records published for both sites April 1929 to September 1930. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 1308: 1938(M). WSP 1508: 1917(M), 1920, 1932(M), 1934-35(M). WSP 1913: 1954(M).

GAGE.--Water-stage recorder. Datum of gage is 1,002.14 ft (305.452 m), adjustment of 1928, (levels by Geodetic Survey of Canada). Prior to Apr. 1, 1929, nonrecording gage at site at Caribou 0.6 mi (1.0 km) upstream at datum 0.95 ft (0.290 m) lower.

REMARKS.--Records fair except those for the winter period, which are poor. Occasionally, at high stages, there is some natural diversion of flow above station to headwaters of Two Rivers.

COOPERATION.--This station is one of the international gaging stations maintained by the United States under agreement with Canada.

AVERAGE DISCHARGE.--26 years (water years 1921-30, 1933, 1937, 1941-43, 1973-83), 284 ft^3/s (8.043 m^3/s), 205,800 acre-ft/yr (254 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,080 ft^3/s (116 m^3/s) May 19, 1950, gage height, 11.81 ft (3.600 m); no flow Aug. 13, 1936.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of 1916 is reported to have reached a stage of about 15.5 ft (4.72 m) at former site.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,400 ft^3/s (39.6 m^3/s) Apr. 8, gage height, 7.35 ft (2.240 m); maximum gage height, 10.60 ft (3.231 m) about Apr. 6, from high-water mark (backwater from ice); minimum discharge, 7.1 ft^3/s (0.20 m^3/s) Aug. 27, gage height, 1.54 ft (0.469 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	546	100	36	26	29	700	722	594	899	45	121
2	91	509	120	35	26	30	1000	695	578	889	45	108
3	123	470	140	35	26	31	1200	726	559	886	45	92
4	168	436	150	34	26	32	1300	748	532	883	42	75
5	215	408	150	34	26	35	1350	731	504	886	41	66
6	251	382	150	33	25	50	1370	691	464	889	39	60
7	296	357	150	33	25	80	1380	642	433	886	38	54
8	360	335	150	32	25	150	1390	590	422	877	34	53
9	484	315	140	32	24	250	1390	539	396	858	32	48
10	597	290	130	31	24	500	1380	496	363	833	29	44
11	670	269	110	31	24	700	1380	482	326	784	26	36
12	720	250	90	31	25	750	1380	546	305	722	22	38
13	770	240	80	31	25	800	1360	653	313	645	21	34
14	783	230	75	31	25	800	1350	761	320	567	18	32
15	786	215	70	31	26	800	1350	854	354	486	17	35
16	788	200	65	30	26	760	1350	884	476	413	15	35
17	795	190	60	30	26	730	1350	894	605	349	15	32
18	801	190	57	30	26	700	1300	892	686	295	13	34
19	805	190	54	30	26	650	1270	880	719	244	13	32
20	801	190	52	29	26	600	1240	859	739	204	11	42
21	799	180	50	29	26	670	1220	838	739	188	11	47
22	794	170	48	29	26	540	1170	824	733	179	10	50
23	790	160	47	28	26	520	1120	796	751	158	9.6	49
24	778	150	46	28	26	500	1070	767	787	131	9.0	49
25	764	140	44	28	27	480	1000	737	821	105	8.7	50
26	745	130	42	27	27	460	937	708	843	82	8.2	46
27	720	120	41	27	28	440	867	681	855	70	7.8	44
28	693	115	40	27	28	420	828	661	868	61	9.4	43
29	663	110	39	27	---	400	788	642	880	53	47	42
30	620	105	38	27	---	400	755	626	902	50	126	42
31	586	---	37	27	---	500	---	609	---	48	132	---
TOTAL	18311	7592	2565	943	722	13707	35545	22174	17867	14620	939.7	1533
MEAN	591	253	82.7	30.4	25.8	442	1185	715	596	472	30.3	51.1
MAX	805	546	150	36	28	800	1390	894	902	899	132	121
MIN	55	105	37	27	24	29	700	482	305	48	7.8	32
AC-FT	36320	15060	5090	1870	1430	27190	70500	43980	35440	29000	1860	3040

CAL YR 1982 TOTAL 114857.0 MEAN 315 MAX 1660 MIN 12 AC-FT 227800
WTR YR 1983 TOTAL 136518.7 MEAN 374 MAX 1390 MIN 7.8 AC-FT 270800

BEST COPY AVAILABLE

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1972 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: November 1973 to September 1983 (discontinued).
WATER TEMPERATURES: October 1980 to September 1983 (discontinued).

INSTRUMENTATION.--Water-quality minimonitor October 1980 to September 1983.

REMARKS.--Extremes are published for those years with 80 percent or more record. Letter K indicates non-ideal colony count.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water year 1981): Maximum, 803 micromhos Jan. 21, 1981; minimum, 261 micromhos Mar. 30, Apr. 1, 2, 1981.
WATER TEMPERATURES (water year 1981): Maximum, 27.0°C July 19, 1981; minimum, 0.0°C several days during winter period.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
26...	1100	790	345	330	7.6	7.7	11.0	6.0	5.0	730	9.5
JAN											
04...	1230	35	740	704	7.5	7.2	-3.0	.0	4.3	726	1.6
APR											
12...	1030	1400	240	233	7.4	7.3	2.0	4.5	1.4	737	10.2
AUG											
02...	1015	44	427	393	8.3	8.2	23.0	24.5	24	735	6.8

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
OCT											
26...	80	30	96	45	16	3.9	1.6	163	23	3.1	.10
JAN											
04...	12	K10	58	92	39	12	3.3	385	28	4.1	.20
APR											
12...	82	K1	270	29	11	2.5	4.1	105	13	3.4	<.10
AUG											
02...	85	K77	250	54	21	5.6	.70	212	11	2.2	.20

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT											
26...	14	251	<.100	.030	.90	.030	<.010	<.010	11	23	88
JAN											
04...	18	465	.150	.330	1.3	.040	.020	<.010	65	6.1	86
APR											
12...	7.7	167	<.100	.040	.80	.090	.060	.030	10	38	77
AUG											
02...	12	281	<.100	.020	1.1	.140	.100	.070	38	4.5	99

DATE	TIME	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
OCT											
26...	1100	20	1	46	<1	<1	--	<3	3	78	2
JAN											
04...	1230	70	3	84	<1	<1	<1	<3	7	200	3
APR											
12...	1030	40	1	31	<1	<1	<1	<3	2	110	4
AUG											
02...	1015	10	4	69	<0	<1	2	<3	4	32	1

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
OCT										
26...	5	10	<.1	<10	5	<1	<1	83	<6	<4
JAN										
04...	19	420	<.1	<10	2	--	<1	230	<6	36
APR										
12...	6	21	.1	10	1	<1	<1	55	<6	7
AUG										
02...	10	19	.2	<10	4	<1	<1	110	<6	3

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	368	362	365	482	478	480	730	726	728
2	---	---	---	372	368	370	485	444	468	728	726	728
3	---	---	---	373	370	371	446	437	439	739	731	735
4	---	---	---	377	373	374	449	437	441	742	739	741
5	---	---	---	378	375	376	483	456	471	740	731	735
6	---	---	---	382	377	379	496	486	492	730	727	728
7	---	---	---	384	381	382	516	494	504	728	726	727
8	---	---	---	384	380	382	519	510	514	726	722	724
9	---	---	---	386	380	382	520	513	517	721	716	719
10	---	---	---	384	380	382	530	521	524	714	706	710
11	---	---	---	383	380	381	561	535	549	705	701	703
12	---	---	---	400	380	388	569	562	567	701	697	699
13	---	---	---	409	390	398	576	571	574	697	692	694
14	---	---	---	399	390	392	590	578	582	690	678	687
15	---	---	---	404	400	402	593	584	589	684	682	683
16	---	---	---	410	404	408	606	596	601	684	680	682
17	---	---	---	406	399	402	614	608	610	686	683	684
18	---	---	---	421	400	410	620	615	617	689	684	686
19	---	---	---	425	411	419	633	622	628	692	687	690
20	---	---	---	414	407	410	647	635	641	690	689	690
21	---	---	---	462	415	436	656	650	653	687	683	685
22	---	---	---	467	437	447	660	656	658	682	679	680
23	---	---	---	451	441	447	659	654	656	677	674	676
24	---	---	---	457	451	454	659	656	658	672	668	670
25	---	---	---	461	459	460	673	662	668	666	664	665
26	---	---	---	464	460	462	683	676	680	671	664	667
27	351	349	350	475	466	471	691	685	688	677	671	674
28	354	349	352	477	475	476	687	684	685	677	675	676
29	357	352	354	481	477	480	703	691	697	673	670	672
30	361	356	358	484	480	482	720	705	714	669	668	668
31	364	359	361	---	---	---	728	723	725	670	666	668
MONTH	---	---	---	484	362	413	728	437	590	742	664	696

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	669	667	668	604	602	603	253	220	232	332	330	331
2	668	665	667	604	602	603	249	219	231	336	332	334
3	665	663	664	603	601	602	241	204	217	336	327	329
4	668	663	666	604	598	601	217	196	206	331	325	328
5	671	666	669	599	557	582	248	202	232	335	330	333
6	673	669	671	561	326	462	250	240	247	341	335	338
7	675	671	673	323	287	306	241	202	225	348	341	345
8	677	673	675	285	261	273	224	204	213	354	347	351
9	678	675	677	265	235	249	235	219	224	362	353	357
10	676	675	676	233	217	223	240	236	238	369	362	366
11	674	671	672	222	216	218	240	237	239	371	367	369
12	669	664	666	228	224	226	240	231	239	377	370	374
13	662	656	659	235	228	230	237	229	235	385	377	381
14	654	649	652	246	236	241	238	234	236	383	378	381
15	647	641	644	245	244	245	242	235	239	380	376	378
16	640	635	637	245	239	242	247	237	243	383	379	381
17	632	629	631	242	237	239	247	244	246	381	376	378
18	628	626	627	242	238	240	248	244	246	374	371	372
19	627	625	626	251	223	240	261	247	254	372	370	371
20	625	624	625	242	220	236	260	253	257	371	369	370
21	622	621	622	278	221	235	261	258	260	371	368	370
22	622	619	621	248	226	235	256	246	250	375	370	373
23	621	619	620	251	220	234	291	245	259	379	374	376
24	621	618	620	247	219	235	311	277	296	380	379	379
25	618	616	617	270	222	244	307	291	301	384	380	382
26	616	615	616	259	234	245	312	307	310	385	382	384
27	614	610	612	272	233	250	319	312	315	386	382	384
28	608	605	607	265	239	249	322	318	320	387	384	386
29	---	---	---	269	224	243	327	322	325	382	376	378
30	---	---	---	265	227	242	331	327	329	393	379	387
31	---	---	---	250	220	236	---	---	---	394	388	391
MONTH	678	605	646	604	216	307	331	196	255	394	325	366

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	390	387	389				---	---	---	377	346	356
2	395	388	391				---	---	---	407	378	393
3	404	394	399				455	431	441	423	406	414
4	430	401	403				466	449	456	436	423	431
5	401	396	398				471	452	460	437	429	435
6	397	392	395				473	457	465	429	418	425
7	392	388	390				522	479	502	416	393	405
8	403	389	397				519	473	488	405	391	396
9	404	399	401				472	444	456	397	385	390
10	---	---	---				452	439	445	387	380	383
11	---	---	---				479	452	468	383	378	380
12	---	---	---				473	460	466	383	378	380
13	---	---	---				492	470	477	386	382	384
14	---	---	---				482	468	475	383	380	382
15	---	---	---				481	466	474	381	372	375
16	---	---	---				489	469	480	373	366	370
17	---	---	---				480	462	472	370	360	365
18	---	---	---				487	476	479	370	365	368
19	---	---	---				498	486	492	368	363	366
20	---	---	---				501	494	497	367	363	365
21	---	---	---				517	501	507	367	361	364
22	---	---	---				522	517	518	367	363	365
23	---	---	---				523	520	521	366	362	364
24	---	---	---				527	522	524	367	365	366
25	---	---	---				533	526	528	375	365	369
26	---	---	---				534	531	532	376	373	374
27	---	---	---				531	526	528	379	374	376
28	---	---	---				528	521	524	378	357	371
29	---	---	---				533	528	531	356	346	350
30	---	---	---				517	444	478	349	345	347
31	---	---	---				434	367	388	---	---	---
MONTH	---	---	---				---	---	---	437	345	380

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	5.0	4.5	5.0	.0	.0	.0	.0	.0	.0
2	---	---	---	5.0	3.5	4.5	.0	.0	.0	.0	.0	.0
3	---	---	---	3.5	2.0	2.5	.0	.0	.0	.0	.0	.0
4	---	---	---	2.0	1.0	1.5	.0	.0	.0	.0	.0	.0
5	---	---	---	1.0	.5	1.0	.0	.0	.0	.0	.0	.0
6	---	---	---	1.0	.5	.5	.0	.0	.0	.0	.0	.0
7	---	---	---	1.0	.5	.5	.0	.0	.0	.0	.0	.0
8	---	---	---	1.0	.5	.5	.0	.0	.0	.0	.0	.0
9	---	---	---	.5	.0	.0	.0	.0	.0	.0	.0	.0
10	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	---	---	---	.5	.0	.0	.0	.0	.0	.0	.0	.0
12	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	---	---	---	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	7.5	6.5	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	7.5	7.5	7.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	7.5	7.0	7.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	7.0	5.5	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
31	5.5	5.0	5.5	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	---	---	---	5.0	.0	.5	.0	.0	.0	.0	.0	.0

BEST COPY AVAILABLE

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	9.0	7.5	8.5
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	10.5	8.5	9.5
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.5	10.0	10.5
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	11.0	9.5	10.5
5	.0	.0	.0	.0	.0	.0	.0	.0	.0	12.0	10.0	11.0
6	.0	.0	.0	.0	.0	.0	1.5	.0	.5	13.0	11.0	12.0
7	.0	.0	.0	.0	.0	.0	2.5	.5	1.5	12.5	11.0	11.5
8	.0	.0	.0	.0	.0	.0	3.0	1.0	2.0	13.0	11.0	12.0
9	.0	.0	.0	.0	.0	.0	4.0	2.5	3.0	12.0	11.5	12.0
10	.0	.0	.0	.0	.0	.0	4.5	3.0	4.0	11.5	11.0	11.5
11	.0	.0	.0	.0	.0	.0	5.0	4.0	4.5	11.0	10.0	10.5
12	.0	.0	.0	.0	.0	.0	5.0	4.5	5.0	9.5	8.5	9.0
13	.0	.0	.0	.0	.0	.0	4.5	3.5	4.0	9.0	8.0	8.5
14	.0	.0	.0	.0	.0	.0	3.5	2.5	3.0	8.0	6.5	7.5
15	.0	.0	.0	.0	.0	.0	3.5	2.0	3.0	9.0	7.0	8.0
16	.0	.0	.0	.0	.0	.0	4.0	2.5	3.0	10.0	7.5	8.5
17	.0	.0	.0	.0	.0	.0	4.5	3.5	4.0	10.5	8.5	9.5
18	.0	.0	.0	.0	.0	.0	5.0	4.5	4.5	12.0	9.0	10.5
19	.0	.0	.0	.0	.0	.0	5.5	4.0	4.5	12.5	11.0	12.0
20	.0	.0	.0	.0	.0	.0	7.0	5.0	6.0	13.0	10.5	12.0
21	.0	.0	.0	.0	.0	.0	8.5	7.0	7.5	13.5	12.5	13.0
22	.0	.0	.0	.0	.0	.0	9.0	8.0	8.5	14.0	12.5	13.5
23	.0	.0	.0	.0	.0	.0	10.0	8.5	9.5	15.0	13.5	14.5
24	.0	.0	.0	.0	.0	.0	11.0	9.5	10.5	15.5	14.0	15.0
25	.0	.0	.0	.0	.0	.0	11.0	10.5	11.0	15.5	13.5	14.5
26	.0	.0	.0	.0	.0	.0	12.0	11.0	11.0	15.5	14.5	15.0
27	.0	.0	.0	.0	.0	.0	11.0	9.0	10.0	16.5	14.5	15.5
28	.0	.0	.0	.0	.0	.0	8.5	7.5	8.0	17.0	15.5	16.0
29	---	---	---	.0	.0	.0	7.5	6.5	6.5	15.5	14.5	15.0
30	---	---	---	.0	.0	.0	8.0	6.0	7.0	14.5	13.5	14.0
31	---	---	---	.0	.0	.0	---	---	---	15.5	13.0	14.5
MONTH	.0	.0	.0	.0	.0	.0	12.0	.0	4.5	17.0	6.5	12.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	16.0	14.5	15.0				---	---	---	25.5	22.5	24.0
2	16.5	15.0	15.5				---	---	---	25.5	23.0	24.5
3	17.0	15.5	16.5				28.5	24.0	26.0	25.0	22.5	23.5
4	16.5	15.0	16.0				30.0	26.0	28.0	22.5	20.0	21.5
5	15.5	14.0	14.5				30.5	27.5	28.5	21.5	19.5	20.5
6	16.0	14.0	15.0				27.5	24.5	26.5	19.5	17.0	17.5
7	17.0	14.0	15.5				29.0	25.0	26.5	18.5	15.5	17.0
8	17.5	15.5	16.5				27.0	23.5	25.5	18.5	17.5	18.0
9	18.0	15.5	16.5				25.5	22.5	24.0	18.5	16.0	17.0
10	---	---	---				26.0	22.0	23.5	18.0	15.5	17.0
11	---	---	---				25.5	21.5	23.5	15.0	13.5	14.0
12	---	---	---				26.0	22.0	24.0	14.5	12.5	13.5
13	---	---	---				26.5	22.5	24.5	13.5	11.5	12.5
14	---	---	---				26.0	21.5	23.5	13.0	10.5	12.0
15	---	---	---				27.0	22.5	24.5	13.0	12.5	12.5
16	---	---	---				23.5	21.0	22.0	12.5	11.5	12.0
17	---	---	---				25.0	19.0	21.5	12.5	11.5	12.0
18	---	---	---				26.5	21.5	23.5	12.0	10.5	11.0
19	---	---	---				25.5	22.0	23.5	10.5	9.0	9.5
20	---	---	---				22.5	19.0	20.0	9.5	8.5	8.5
21	---	---	---				22.0	18.0	19.5	8.5	7.0	8.0
22	---	---	---				22.0	17.5	20.0	7.5	6.5	7.0
23	---	---	---				23.0	19.0	21.0	8.0	5.5	6.5
24	---	---	---				24.5	20.5	22.0	10.5	7.5	9.0
25	---	---	---				26.0	21.5	23.5	13.0	10.0	11.5
26	---	---	---				26.0	22.5	24.0	14.0	11.0	12.5
27	---	---	---				26.0	22.0	24.0	15.0	12.0	13.5
28	---	---	---				25.5	21.5	23.5	15.5	14.0	15.0
29	---	---	---				24.5	21.0	23.0	14.0	11.5	12.5
30	---	---	---				23.5	21.5	22.5	11.5	10.5	10.5
31	---	---	---				24.0	20.5	22.5	---	---	---
MONTH	---	---	---				---	---	---	25.5	5.5	14.0

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05124480 KAWISHIWI RIVER NEAR ELY, MN

(Hydrologic bench-mark station)

LOCATION.--Lat 47°55'22", long 91°32'06", in SE¼SE¼ sec.24, T.63 N., R.10 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, on left bank upstream from rapids, 2 mi (3 km) upstream from South Kawishiwi River, 2.2 mi (3.5 km) southwest of Fernberg Lookout Tower and 14 mi (23 km) east of Ely.

DRAINAGE AREA.--253 mi^2 (655 km^2).

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1966 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,450 ft (442 m), from topographic map.

REMARKS.--Records fair.

AVERAGE DISCHARGE.--17 years, 219 ft^3/s (6.202 m^3/s), 11.76 in/yr (299 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,720 ft^3/s (48.7 m^3/s) Apr. 24, 1976, gage height, 5.92 ft (1.804 m); minimum 4.5 ft^3/s (0.13 m^3/s) Jan. 30 to Feb. 2, 1977, gage height, 2.14 ft (0.652 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 620 ft^3/s (17.6 m^3/s) May 13, gage height, 4.70 ft (1.433 m); minimum, 63 ft^3/s (1.78 m^3/s) about Oct. 2, gage height, 3.05 ft (0.930 m) from recorded range-in-stage.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	525	480	206	123	84	69	383	422	213	139	94
2	75	508	475	200	120	82	70	417	417	203	134	91
3	84	525	470	196	118	82	73	443	417	222	132	90
4	90	542	470	192	116	81	73	475	407	313	130	86
5	100	525	464	188	115	81	73	502	392	340	127	84
6	110	508	459	184	113	81	74	530	378	340	123	82
7	122	497	448	180	111	82	76	553	373	344	116	78
8	130	480	438	176	107	85	77	565	359	349	111	76
9	148	464	428	172	105	85	79	583	354	336	107	163
10	194	448	417	168	105	84	81	602	344	318	107	194
11	247	443	397	165	105	82	82	608	349	300	107	210
12	318	438	387	162	105	79	85	602	340	270	103	222
13	373	422	383	159	103	79	88	614	336	247	100	232
14	417	412	373	156	102	79	97	608	336	225	99	236
15	448	397	354	153	99	78	105	590	340	213	94	240
16	459	387	340	150	94	78	103	577	344	203	92	244
17	486	373	331	147	94	78	103	565	354	200	91	232
18	502	368	322	145	94	78	103	553	363	192	88	225
19	530	363	308	143	94	78	105	542	378	184	96	213
20	548	412	296	141	94	77	107	530	383	182	92	203
21	559	453	287	138	94	74	115	525	373	176	90	194
22	571	475	270	135	94	73	123	519	359	167	86	189
23	577	502	262	132	91	73	134	502	340	161	82	182
24	583	513	255	129	88	72	146	486	322	156	90	174
25	590	519	247	127	86	72	163	464	308	154	96	165
26	590	519	240	125	86	72	192	448	291	150	94	161
27	590	508	232	125	85	70	236	433	262	146	92	156
28	583	497	224	125	85	70	279	422	244	143	96	154
29	577	486	220	127	---	69	322	438	229	139	100	158
30	565	486	214	128	---	69	354	438	222	135	103	176
31	542	---	210	127	---	69	---	433	---	137	99	---
TOTAL	11775	13995	10701	4801	2826	2396	3787	15950	10336	6858	3216	5004
MEAN	380	467	345	155	101	77.3	126	515	345	221	104	167
MAX	590	542	480	206	123	85	354	614	422	349	139	244
MIN	67	363	210	125	85	69	69	383	222	135	82	76
CFSM	1.50	1.85	1.36	.61	.40	.31	.50	2.04	1.36	.87	.41	.66
IN.	1.73	2.06	1.57	.71	.42	.35	.56	2.35	1.52	1.01	.47	.74
AC-FT	23360	27760	21230	9520	5610	4750	7510	31640	20500	13600	6380	9930

CAL YR 1982	TOTAL	93284	MEAN	256	MAX 1100	MIN 42	CFSM 1.01	IN 13.72	AC-FT	185000	
WTR YR 1983	TOTAL	91645	MEAN	251	MAX 614	MIN 67	CFSM .99	IN 13.48	AC-FT	181800	

BEST COPY AVAILABLE

05124480 KAWISHIWI RIVER NEAR ELY, MN--Continued
(Hydrologic bench-mark station)

WATER-QUALITY DATA

PERIOD OF RECORD.--Water years, 1966 to current year.

REMARKS.--Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT											
07...	1020	118	32	20	6.8	7.8	8.0	11.0	--	--	8.7
MAR											
24...	1130	74	37	. . 36	6.8	6.5	-5.0	1.0	1.0	730	12.7
MAY											
18...	1130	553	29	34	6.9	7.2	12.0	12.0	1.3	727	9.3
AUG											
30...	1100	103	<50	31	7.1	6.7	19.0	22.5	<1.0	726	7.5

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	ALKA-LINITY LAB (MG/L AS CACO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
OCT											
07...	81	K6	200	3.1	1.4	1.7	<.10	10	3.0	1.0	<.10
MAR											
24...	93	<1	66	3.3	1.4	1.1	.50	11	12	.70	<.10
MAY											
18...	90	K2	71	3.0	1.3	.90	.30	10	5.0	1.0	<.10
AUG											
30...	91	K8	K9	3.1	1.4	1.0	.30	11	3.0	.70	<.10

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT											
07...	3.3	32	<.100	.030	.50	.030	<.010	--	--	--	--
MAR											
24...	5.3	58	.140	.030	.50	<.010	<.010	<.010	--	--	--
MAY											
18...	5.0	39	<.100	.020	.40	.020	.020	.080	4	6.0	90
AUG											
30...	3.5	26	<.100	.050	.30	<.010	<.010	<.010	--	--	--

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05124480 KAWISHIWI RIVER NEAR ELY, MN--Continued(

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
MAR 24...	1130	90	1	14	<1	<1	7	<3	2	220	3
MAY 18...	1130	100	1	10	0	1	6	3	5	190	<1

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
MAR 24...	<4	9	.2	<10	5	<1	<1	12	<6	<3
MAY 18...	4	6	<.1	10	<1	1	<1	11	6	9

DATE	TIME	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DISSOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L) (09511)	URANIUM NATURAL DISSOLVED (UG/L AS U) (22703)
MAR 24...	1130	<.7	<.4	2.0	.5	1.9	.5	.08	<.4

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05124990 FILSON CREEK NEAR ELY, MN

LOCATION.--Lat 47°50'05", long 91°40'27", in SE¼SW¼ sec.24, T.61 N., R.10 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, on right bank 25 ft (7.6 m) upstream from culverts on Forest Route 181, also known as Spruce Road, 0.8 mi (1.3 km) upstream from mouth, and 10 mi (16 km) southeast of Ely.

DRAINAGE AREA.--9.66 mi^2 (25.02 km^2).

PERIOD OF RECORD.--October 1974 to current year.

REVISED RECORDS.--WDR MN-79-1: 1975-76, 1978.

GAGE.--Water-stage recorder. Altitude of gage is 1,440 ft (439 m), from topographic map.

REMARKS.--Records fair except those for winter period, which are poor.

AVERAGE DISCHARGE.--9 years, 7.63 ft^3/s (0.216 m^3/s), 10.73 in/yr (273 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 426 ft^3/s (12.1 m^3/s) Sept. 13, 1980, gage height, 8.87 ft (2.704 m); no flow at times most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 66 ft^3/s (1.87 m^3/s) Oct. 11, 12, gage height, 6.11 ft (1.862 m); maximum gage height, 6.89 ft (2.100 m) Feb. 7, 8, (backwater from ice); minimum discharge, 0.52 ft^3/s (0.015 m^3/s) Aug. 9, 10, 17, 18, 19, 23, 24, gage height, 4.69 ft (1.430 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.3	8.6	11	1.4	1.3	1.2	1.6	24	13	2.9	2.2	2.4
2	2.2	7.7	11	1.4	1.3	1.2	2.1	22	12	2.9	1.8	1.9
3	3.1	9.3	11	1.4	1.3	1.2	3.0	20	12	6.6	1.9	1.5
4	4.3	13	11	1.4	1.3	1.2	4.0	19	11	28	1.5	1.3
5	4.7	16	11	1.4	1.3	1.3	5.0	17	10	45	1.4	1.2
6	9.6	16	9.5	1.4	1.3	1.5	7.0	16	9.6	41	1.1	1.4
7	30	15	8.0	1.4	1.3	4.7	9.0	15	8.6	38	.82	1.4
8	38	14	6.4	1.4	1.3	4.2	11	13	7.7	31	.66	1.3
9	38	13	5.4	1.4	1.3	3.4	16	12	7.1	23	.59	15
10	55	13	4.5	1.4	1.3	2.9	20	11	6.6	17	1.0	20
11	63	13	3.6	1.4	1.3	2.5	18	11	6.8	14	1.1	19
12	62	13	3.0	1.4	1.3	2.2	18	10	6.8	10	1.1	15
13	56	13	2.7	1.4	1.3	1.9	18	12	6.8	8.3	1.1	12
14	49	12	2.5	1.4	1.3	1.6	18	14	7.4	6.8	1.0	10
15	40	11	2.3	1.4	1.3	1.4	18	13	9.3	5.5	.66	9.3
16	32	10	2.2	1.4	1.2	1.3	15	12	13	4.7	.59	9.3
17	26	9.6	2.1	1.4	1.2	1.2	13	11	14	4.7	.59	9.3
18	24	9.0	2.0	1.4	1.2	1.2	12	10	12	4.3	.52	9.3
19	22	10	1.9	1.4	1.2	1.1	12	10	10	4.1	1.8	8.3
20	20	22	1.8	1.4	1.2	1.1	14	10	9.0	3.8	1.3	7.4
21	17	25	1.7	1.3	1.2	1.0	18	11	7.7	3.8	1.0	7.1
22	15	37	1.6	1.3	1.2	1.0	22	11	7.1	3.2	.90	6.8
23	14	33	1.6	1.3	1.2	.98	27	11	6.3	3.2	.59	6.0
24	13	30	1.5	1.3	1.2	.96	32	11	5.5	1.9	2.5	5.5
25	12	26	1.5	1.3	1.2	.94	35	10	5.0	1.7	3.6	5.0
26	11	22	1.5	1.3	1.2	.92	36	9.0	4.7	1.7	3.2	4.7
27	10	17	1.5	1.3	1.2	.90	39	8.3	3.8	1.7	2.7	4.3
28	9.3	15	1.5	1.3	1.2	.90	35	8.6	3.2	1.7	3.6	4.1
29	9.0	13	1.4	1.3	---	.90	30	11	2.9	1.8	3.6	6.6
30	9.3	12	1.4	1.3	---	.90	27	12	2.9	1.5	3.8	12
31	9.3	---	1.4	1.3	---	1.0	---	13	---	1.9	3.1	---
TOTAL	709.1	478.2	129.5	42.3	35.1	48.70	535.7	397.9	241.8	325.7	51.32	218.4
MEAN	22.9	15.9	4.18	1.36	1.25	1.57	17.9	12.8	8.06	10.5	1.66	7.28
MAX	63	37	11	1.4	1.3	4.7	39	24	14	45	3.8	20
MIN	1.3	7.7	1.4	1.3	1.2	.90	1.6	8.3	2.9	1.5	.52	1.2
CFSM	2.37	1.65	.43	.14	.13	.16	1.85	1.33	.83	1.09	.17	.75
IN.	2.73	1.84	.50	.16	.14	.19	2.06	1.53	.93	1.25	.20	.84

CAL YR 1982 TOTAL 3471.75 MEAN 9.51 MAX 82 MIN .18 CFSM .98 IN 13.37
WTR YR 1983 TOTAL 3213.72 MEAN 8.80 MAX 63 MIN .52 CFSM .91 IN 12.37

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05127000 KAWISHIWI RIVER NEAR WINTON, MN

LOCATION.--Lat 47°56'05", long 91°45'50", in NE¼NW¼ sec.20, T.63 N., R.11 W., Lake County, Hydrologic Unit 09030001, Superior National Forest, at powerplant of Minnesota Power & Light Co., just upstream from Fall Lake, and 1.8 mi (2.9 km) east of Winton.

DRAINAGE AREA.--1,229 mi^2 (3,183 km^2).

PERIOD OF RECORD.--June 1905 to June 1907, October 1912 to September 1919 (fragmentary), September 1923 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WDR MN-77-1: Drainage area.

REMARKS.--Records fair. Daily discharge computed from powerplant records. Flow regulated by powerplant and by Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, South Farm, and Garden Lakes.

COOPERATION.--Records collected by Minnesota Power & Light Co., under general supervision of Geological Survey, in connection with a Federal Power Commission project.

AVERAGE DISCHARGE (unadjusted).--64 years (water years 1906, 1916-17, 1919, 1924-83), 1,033 ft^3/s (29.25 m^3/s), 11.41 in/yr (290 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 16,000 ft^3/s (453 m^3/s) May 18, 1950; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 4,690 ft^3/s (133 m^3/s) Oct. 17; no flow Aug. 14.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	835	2100	2510	876	714	631	426	2150	1730	863	824	452
2	996	2100	2460	962	714	598	459	2210	1920	833	760	484
3	932	2160	2280	873	695	597	395	2310	2100	972	727	581
4	867	2100	2220	821	647	564	481	2470	2000	1430	760	549
5	964	2030	2220	785	525	596	458	2730	2000	1990	577	549
6	1420	2160	2240	846	494	613	577	2420	2000	2330	428	754
7	2070	2200	2080	864	614	775	661	2250	2000	2550	495	807
8	2340	2170	1900	757	632	804	691	2240	1880	2700	398	746
9	2500	2140	1790	792	663	863	675	2260	1770	3310	463	1270
10	2440	2110	1780	930	695	799	588	2390	1700	3430	430	1260
11	2700	2040	1600	757	679	827	705	2710	1740	3510	367	1330
12	3340	2100	1610	792	461	762	756	2720	1600	3220	399	1130
13	4010	2000	1550	760	461	762	842	2670	1550	2740	399	1050
14	4500	2030	1480	792	563	760	950	2500	1660	2040	0	992
15	4600	1760	1380	760	531	793	1020	2360	1600	1720	348	960
16	4660	1800	1280	760	595	721	950	2270	1700	1490	399	1290
17	4690	1670	1200	760	595	657	950	2180	1900	1400	368	1290
18	4610	1580	1230	760	414	721	950	2250	1810	1300	400	1230
19	4420	1590	1130	792	591	721	950	1980	1740	111-	432	1160
20	4300	1860	1120	760	494	689	982	2000	1760	1120	428	962
21	3960	2040	928	760	429	589	1080	2000	1760	1120	400	962
22	3660	2230	928	792	527	523	1050	1980	1830	992	368	962
23	3350	2810	817	760	527	459	1110	2010	1860	992	400	865
24	2850	2880	729	760	712	491	1080	1950	1660	833	368	897
25	2840	2920	794	792	712	427	1210	1950	1630	962	667	865
26	2430	3010	762	695	526	427	1310	1850	1370	865	483	879
27	2270	2910	762	695	495	459	1240	1850	1380	831	398	865
28	2210	3040	794	710	663	557	1490	1880	1050	820	495	930
29	2150	2940	794	591	---	562	1810	1910	960	663	398	897
30	2130	2780	794	559	---	512	1970	1840	960	792	398	934
31	2160	---	932	658	---	523	---	1900	---	760	430	---
TOTAL	87204	67260	44094	23971	16368	19782	27816	68190	50620	49688	14207	27902
MEAN	2813	2242	1422	773	585	638	927	2200	1687	1603	458	930
MAX	4690	3040	2510	962	714	863	1970	2730	2100	3510	824	1330
MIN	835	1580	729	559	414	427	395	1840	960	663	0	452
†	-18	+30	-22	-236	-218	-181	+294	+335	-51	+15	-15	+47
MEAN ‡	2795	2272	1400	537	367	457	1221	2535	1636	1618	443	977
CFSM ‡	2.27	1.85	1.14	.44	.30	.37	.99	2.06	1.33	1.32	.36	.79
IN. ‡	2.62	2.06	1.31	.50	.31	.43	1.11	2.38	1.49	1.52	.42	.89

CAL YR 1982 TOTAL 533442.00 MEAN 1461 MAX 5630 MIN .00 MEAN ‡ 1382 CFSM ‡ 1.12 IN ‡ 15.27
WTR YR 1983 TOTAL 497102.00 MEAN 1362 MAX 4690 MIN .00 MEAN ‡ 1284 CFSM ‡ 1.04 IN ‡ 15.04

† Change in contents, equivalent in cubic feet per second, in Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, Farm, South Farm, and Garden Lakes.
‡ Adjusted for change in reservoir content.

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05127500 BASSWOOD RIVER NEAR WINTON, MN

(International gaging station)

LOCATION.--Lat 48°04'57", long 91°39'09", in SE¼SE¼ sec.30, T.65 N., R.10 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, on island in Jackfish Bay of Basswood Lake, used to determine discharge at outlet [lat 48°06'21", long 91°38'51", in sec.19, T.65 N., R.10 W., on international boundary 14 mi (23 km) northeast of Winton].

DRAINAGE AREA.--1,740 mi^2 (4,510 km^2), approximately (above outlet of Basswood Lake).

PERIOD OF RECORD.--March to June 1924, September 1925 to March 1928, January 1930 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 955: Drainage area. WSP 1145: 1935, 1937.

GAGE.--Water-stage recorder. Datum of gage is 1,296.80 ft (395.265 m), adjustment of 1928, (levels by Geodetic Survey of Canada). Prior to Oct. 27, 1938, nonrecording gages at several sites in vicinity of gage, at datum 3.0 ft (0.914 m) higher. Oct. 28, 1938, to Sept. 30, 1966, water-stage recorder at datum 3.0 ft (0.914 m) higher.

REMARKS.--Records good. Some regulation by powerplant on Kawishiwi River at Winton, MN, and by many lakes located upstream from station.

COOPERATION.--This station is one of the international gaging stations maintained by the United States under agreement with Canada.

AVERAGE DISCHARGE.--55 years (water years 1926, 1927, 1931-83), 1,397 ft^3/s (39.56 m^3/s), 10.90 in/yr (277 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,600 ft^3/s (442 m^3/s) May 24, 1950, gage height 9.94 ft (3.030 m), present datum; minimum, 55 ft^3/s (1.56 m^3/s) Nov. 18, 1976, gage height, 1.67 ft (0.509 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,260 ft^3/s (121 m^3/s) Oct 23, gage height, 5.57 ft (1.698 m); minimum, 673 ft^3/s (19.1 m^3/s) Sept. 8, gage height, 3.07 ft (0.936 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	862	3280	3360	1590	1220	930	880	1940	2520	1800	1490	772
2	914	3180	3390	1560	1190	920	870	2040	2510	1840	1460	755
3	947	3210	3390	1540	1180	920	850	2140	2490	1930	1440	737
4	961	3270	3370	1510	1180	920	840	2200	2480	1950	1400	716
5	969	3190	3350	1490	1170	920	840	2260	2460	2000	1360	707
6	1060	3130	3300	1480	1140	930	850	2290	2430	2040	1310	704
7	1210	3060	3240	1470	1120	940	870	2300	2400	2120	1250	684
8	1330	3000	3160	1450	1090	950	890	2350	2360	2230	1180	686
9	1500	2960	3110	1430	1080	960	910	2430	2350	2340	1130	962
10	1700	2920	3010	1440	1080	980	930	2590	2340	2440	1110	1020
11	1880	2900	2900	1430	1080	990	950	2650	2320	2510	1060	1080
12	2080	2850	2780	1420	1080	1010	1010	2700	2340	2600	1010	1130
13	2320	2850	2670	1400	1070	1020	1090	2720	2380	2700	974	1160
14	2590	2800	2580	1410	1040	1030	1110	2720	2400	2750	938	1180
15	2850	2770	2500	1400	1030	1040	1130	2730	2380	2720	901	1210
16	3110	2720	2430	1400	1020	1040	1160	2730	2360	2680	855	1230
17	3390	2660	2360	1380	1010	1040	1180	2720	2340	2640	821	1230
18	3640	2610	2290	1360	1010	1040	1190	2700	2320	2540	786	1240
19	3860	2570	2230	1350	1010	1040	1230	2670	2290	2430	778	1240
20	4000	2610	2170	1340	1020	1040	1250	2650	2300	2320	758	1240
21	4130	2670	2110	1330	1020	1040	1290	2600	2290	2220	779	1250
22	4210	2730	2050	1320	1010	1030	1320	2590	2280	2080	756	1250
23	4240	2760	2000	1310	990	1010	1350	2560	2230	1950	737	1250
24	4210	2830	1930	1300	960	980	1400	2520	2170	1870	782	1240
25	4140	2930	1870	1300	950	960	1440	2510	2140	1780	784	1230
26	4040	3020	1810	1290	940	930	1490	2600	2070	1710	803	1220
27	3920	3110	1750	1280	940	900	1550	2590	2010	1640	809	1220
28	3770	3180	1740	1260	930	880	1620	2570	1940	1590	837	1220
29	3660	3260	1700	1250	---	880	1710	2540	1900	1580	824	1220
30	3510	3320	1650	1260	---	890	1830	2510	1840	1530	816	1290
31	3390	---	1620	1240	---	890	---	2510	---	1510	795	---
TOTAL	84393	88350	77820	42990	29560	30050	35030	77630	68640	66040	30733	32073
MEAN	2722	2945	2510	1387	1056	969	1168	2504	2288	2130	991	1069
MAX	4240	3320	3390	1590	1220	1040	1830	2730	2520	2750	1490	1290
MIN	862	2570	1620	1240	930	880	840	1940	1840	1510	737	684
CFSM	1.56	1.69	1.44	.80	.61	.56	.67	1.44	1.32	1.22	.57	.61
IN.	1.80	1.89	1.66	.92	.63	.64	.75	1.66	1.47	1.41	.66	.69
AC-FT	167400	175200	154400	85270	58630	59600	69480	154000	136100	131000	60960	63620

CAL YR 1982 TOTAL 692930 MEAN 1898 MAX 6400 MIN 515 CFSM 1.09 IN 14.81 AC-FT 1374000
WTR YR 1983 TOTAL 663309 MEAN 1817 MAX 4240 MIN 684 CFSM 1.04 IN 14.18 AC-FT 1316000

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05128000 NAMAKAN RIVER AT OUTLET OF LAC LA CROIX, ONTARIO

(International gaging station)

LOCATION.--Lat 48°21'14", long 92°13'01", at Campbell's Camp, on Lac La Croix Lake, used to determine discharge at outlet [Lat 48°23'00", long 92°10'40", 2.5 mi (4.0 km) east of Campbell's Camp].

DRAINAGE AREA.--5,170 mi^2 (13,390 km^2).

PERIOD OF RECORD.--September 1921 to January 1922, April 1922 to current year, in reports of Geological Survey. Monthly discharge only for some periods, published in WSP 1308. August 1921 to current year, in reports of Water Survey of Canada.

GAGE.--Water-stage recorder. Gage readings have been reduced to elevations, United States and Canada Boundary Survey datum. Prior to October 1933, nonrecording gages at various sites on Lac la Croix. October 1933 to Mar. 13, 1963, nonrecording gage at present site and datum.

REMARKS.--Records excellent.

COOPERATION.--This station is one of the international stations maintained by Canada under agreement with the United States.

AVERAGE DISCHARGE.--61 years (water years 1923-83), 3,821 ft^3/s (108.2 m^3/s), 10.04 in/yr (255 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 28,200 ft^3/s (799 m^3/s) May 31 to June 2, 1950, elevation, 1,193.30 ft (363.718 m); minimum, 535 ft^3/s (15.2 m^3/s) at times in February, March and April 1924, elevation, 1,181.50 ft (360.121 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 7,700 ft^3/s (218 m^3/s) Dec. 5, elevation, 1,186.31 ft (361.587 m); minimum daily, 2,490 ft^3/s (70.5 m^3/s) Mar. 29-31, elevation, 1,183.54 ft (360.743 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2590	7270	7490	5430	3740	2990	2510	3710	5920	6200	6170	3410
2	2640	7290	7550	5320	3680	2960	2540	3810	5920	6210	6050	3360
3	2700	7420	7580	5230	3650	2940	2540	3900	5970	6270	6000	3270
4	2710	7640	7620	5100	3620	2910	2540	3980	6080	6300	5870	3230
5	2710	7650	7660	5040	3590	2890	2540	4100	6110	6360	5710	3160
6	2850	7630	7640	4950	3550	2870	2530	4220	6050	6370	5560	3100
7	2970	7590	7660	4890	3510	2880	2530	4300	6110	6360	5370	3050
8	3110	7530	7640	4810	3470	2860	2530	4410	6150	6380	5240	3030
9	3250	7510	7620	4720	3440	2830	2530	4530	6140	6420	5110	3160
10	3400	7400	7580	4680	3410	2810	2540	4620	6170	6410	4980	3080
11	3530	7350	7530	4610	3370	2790	2550	4700	6180	6350	4880	3070
12	3740	7230	7490	4550	3330	2770	2580	4820	6200	6420	4760	3040
13	3930	7280	7430	4500	3300	2730	2600	4890	6240	6510	4640	3000
14	4090	7190	7350	4500	3260	2730	2650	4960	6240	6570	4550	2990
15	4260	7140	7270	4450	3240	2700	2720	5060	6290	6650	4460	3000
16	4470	7070	7200	4420	3200	2680	2740	5140	6380	6730	4330	3000
17	4710	7010	7080	4350	3160	2670	2740	5210	6460	6810	4250	3010
18	4900	6940	6980	4310	3160	2660	2760	5320	6490	6860	4140	2930
19	5150	6900	6850	4260	3150	2650	2770	5380	6480	6930	3980	2940
20	5290	6880	6780	4230	3190	2640	2790	5470	6450	6970	3930	2920
21	5540	6880	6660	4180	3180	2620	2820	5600	6400	7000	3950	2940
22	5780	7060	6540	4140	3160	2610	2860	5590	6510	6930	3880	2960
23	6020	7120	6440	4090	3120	2600	2920	5660	6540	6820	3830	2960
24	6230	7210	6330	4040	3100	2590	2980	5710	6560	6810	3860	2960
25	6440	7260	6210	3990	3070	2570	3060	5730	6500	6750	3800	2950
26	6660	7300	6090	3940	3040	2550	3150	5760	6460	6650	3730	2950
27	6840	7360	5970	3900	3020	2530	3240	5740	6430	6510	3680	2950
28	6980	7390	5850	3860	3010	2510	3360	5790	6330	6440	3670	2950
29	7100	7400	5740	3840	---	2490	3490	5870	6290	6410	3610	2950
30	7130	7480	5650	3810	---	2490	3600	5900	6240	6340	3560	3000
31	7230	---	5560	3780	---	2490	---	5930	---	6270	3500	---
TOTAL	144950	218380	215040	137920	92720	84010	83710	155810	188290	203010	141050	91320
MEAN	4676	7279	6937	4449	3311	2710	2790	5026	6276	6549	4550	3044
MAX	7230	7650	7660	5430	3740	2990	3600	5930	6560	7000	6170	3410
MIN	2590	6880	5560	3780	3010	2490	2510	3710	5920	6200	3500	2920
CFSM	.90	1.41	1.34	.86	.64	.52	.54	.97	1.21	1.27	.88	.59
IN.	1.04	1.57	1.55	.99	.67	.60	.60	1.12	1.35	1.46	1.01	.66

CAL YR 1982 TOTAL 1801130 MEAN 4935 MAX 12400 MIN 1410 CFSM .96 IN 12.96
WTR YR 1983 TOTAL 1756210 MEAN 4812 MAX 7660 MIN 2490 CFSM .93 IN 12.64

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05128200 VERMILION LAKE NEAR SOUDAN, MN

LOCATION.--Lat 47°49'52", long 92°16'20", in SW¼SE¼ sec.20, T.62 N., R.15 W., St. Louis County, Hydrologic Unit 09030002, on south shore of Vermilion Lake, 2 mi (3.2 km) northwest of Soudan.

PERIOD OF RECORD.--October 1913 to July 1915, July 1941 to November 1942, June 1946 to current year (fragmentary during 1947).

GAGE.--Water-stage recorder. Datum of gage is 1,355.10 ft (413.034 m) National Geodetic Vertical Datum of 1929. October 1913 to July 1915, nonrecording gage at Tower, 2 mi (3.2 km) southwest of present gage, at datum about 1,354.60 ft (412.882 m). July 1941 to November 1942, and June 1946 to June 1951, nonrecording gage approximately 13 mi (20.9 km) northwest at Vermilion Dam near Tower, at same datum. All gage readings have been reduced to elevations NGVD.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,359.52 ft (414.382 m) May 16, 1950; minimum observed, 1,356.02 ft (413.315 m) Jan. 29, 1942; minimum 1,355.96 ft (413.297 m) Dec. 14, 1976, result of wind action.

EXTREMES OUTSIDE PERIOD OF RECORD.--Elevation on June 6, 1913, was 1,359.94 ft (414.510 m), determined from reference point set by local observers.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,358.13 ft (413.958 m) Nov. 12, result of wind action; maximum daily, 1,358.08 ft (413.943 m) Oct. 20; minimum recorded, 1,356.98 ft (413.608 m) Sept. 8, result of wind action; minimum daily, 1,357.20 ft (413.675 m) Sept. 8.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

Oct. 31 ..... 1,357.91	Feb. 28 ..... 1,357.25	June 30 ..... 1,357.60
Nov. 30 ..... 1,358.02	Mar. 31 ..... 1,357.23	July 31 ..... 1,357.35
Dec. 31 ..... 1,357.61	Apr. 30 ..... 1,357.77	Aug. 31 ..... 1,357.26
Jan. 31 ..... 1,357.38	May 31 ..... 1,357.67	Sept.30 ..... 1,357.27

NOTE.--Elevations other than those shown above are available.

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05129115 VERMILION RIVER NEAR CRANE LAKE, MN

LOCATION.--Lat 48°15'53", long 92°33'57", in NE¼NE¼ sec. 30, T.67 N., R.17 W., St. Louis County, Hydrologic Unit 09030002, in Superior National Forest, on left bank 350 ft (107 m) downstream from bridge on Forest Route 491, 3.5 mi (5.6 km) upstream from mouth, and 3.5 mi (5.6 km) west of village of Crane Lake.

PERIOD OF RECORD.--August 1979 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,180 ft (360 m), from topographic map.

REMARKS.--Records fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,100 ft^3/s (87.8 m^3/s) Apr. 25, 1982, gage height, 13.04 ft (3.975 m); minimum, 38 ft^3/s (1.08 m^3/s) Aug. 13, 14, 1980, gage height, 3.68 ft (1.122 m).

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1979 reached a stage of 15.15 ft (4.618 m), from high-water mark, discharge, about 4,600 ft^3/s (130 m^3/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,730 ft^3/s (49.0 m^3/s) Oct. 14, gage height, 10.56 ft (3.219 m); maximum gage height, 10.96 ft (3.341 m) Nov. 22 (backwater from ice); minimum discharge, 176 ft^3/s (4.98 m^3/s) Aug. 20, 21, gage height, 5.10 ft (1.554 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	283	840	1220	538	374	298	489	1180	734	622	344	400
2	310	845	1200	536	368	296	588	1140	711	617	333	386
3	392	898	1220	524	360	294	717	1120	703	687	335	378
4	473	964	1260	500	347	293	802	1150	763	787	327	349
5	507	1000	1270	489	343	312	860	1120	751	921	317	332
6	573	1020	1260	489	332	374	905	1050	851	998	303	334
7	835	1020	1230	482	326	446	908	998	827	1010	291	323
8	1080	1010	1140	475	330	466	898	961	766	954	276	319
9	1170	1010	1110	468	338	453	921	934	723	883	256	442
10	1330	1020	1040	464	339	438	898	905	680	820	258	603
11	1490	1020	991	457	339	421	876	873	668	761	257	723
12	1620	1000	921	460	334	414	889	848	683	696	246	766
13	1720	941	879	457	338	419	889	860	702	650	238	754
14	1710	958	845	444	332	414	823	857	725	623	230	711
15	1630	964	820	440	325	408	805	845	788	592	224	708
16	1530	944	793	434	319	402	805	833	1090	573	213	717
17	1440	921	754	423	314	394	778	832	1270	564	205	608
18	1360	902	737	408	312	390	751	814	1250	551	199	598
19	1290	931	728	410	314	378	760	808	1170	537	195	573
20	1230	1210	714	408	317	370	805	781	1070	586	179	555
21	1190	1650	694	404	317	364	941	778	975	606	210	531
22	1160	1700	670	400	317	356	1030	781	957	587	223	512
23	1120	1650	661	388	312	347	1100	787	955	545	212	494
24	1100	1580	653	382	307	339	1130	799	890	504	264	480
25	1060	1500	648	376	301	334	1140	820	842	474	316	464
26	1030	1420	635	368	303	332	1140	814	782	448	347	444
27	1020	1380	616	362	305	334	1200	805	718	428	361	429
28	1000	1330	606	374	301	349	1220	799	686	411	375	421
29	950	1280	593	374	---	378	1230	790	649	408	391	406
30	900	1240	575	380	---	398	1210	772	636	369	403	402
31	860	---	553	378	---	408	---	754	---	364	410	---
TOTAL	33363	34148	27036	13492	9164	11619	27508	27608	25015	19576	8738	15162
MEAN	1076	1138	872	435	327	375	917	891	834	631	282	505
MAX	1720	1700	1270	538	374	466	1230	1180	1270	1010	410	766
MIN	283	840	553	362	301	293	489	754	636	364	179	319
AC-FT	66180	67730	53630	26760	18180	23050	54560	54760	49620	38830	17330	30070

CAL YR 1982 TOTAL 291994 MEAN 800 MAX 3090 MIN 158 AC-FT 579200
WTR YR 1983 TOTAL 252429 MEAN 692 MAX 1720 MIN 179 AC-FT 500700

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05129290 GOLD PORTAGE OUTLET FROM KABETOGAMA LAKE NEAR RAY, MN

LOCATION.--Lat 48°31'28", long 93°04'29", in SW¼NE¼ sec.30, T.70 N., R.21 W., St. Louis County, Hydrologic Unit 09030003, on right bank in bay at head of Gold Portage Outlet from Kabetogama Lake, 9.8 mi (15.8 km) northeast of Ray.

PERIOD OF RECORD.--October 1982 to September 1983.

GAGE.--Water-stage recorder. Datum of gage is 1,100 ft (335 m), adjustment of 1912 (Corps of Engineers benchmark), water surface transfer.

REMARKS.--Records good. Flow completely regulated by outlet dam on Namakan Lake.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 630 ft^3/s (17.8 m^3/s) July 9, 21; no flow Jan. 21 to May 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	433	300	100	20	.00	.00	.00	.00	28	477	580	584
2	440	290	95	18	.00	.00	.00	.00	36	506	600	583
3	440	273	90	16	.00	.00	.00	.00	45	529	589	564
4	440	250	90	14	.00	.00	.00	.00	58	529	586	559
5	440	240	85	13	.00	.00	.00	.00	67	560	584	555
6	440	240	80	10	.00	.00	.00	.00	72	588	579	541
7	470	240	80	7.8	.00	.00	.00	.00	91	606	570	534
8	480	240	75	6.5	.00	.00	.00	.00	110	614	560	535
9	490	240	75	5.0	.00	.00	.00	.00	117	630	569	556
10	520	230	70	3.4	.00	.00	.00	.00	138	626	567	534
11	540	230	65	2.1	.00	.00	.00	.00	142	598	573	530
12	558	230	65	1.3	.00	.00	.00	.00	155	602	580	541
13	549	220	65	.89	.00	.00	.00	.00	169	615	577	540
14	532	220	60	.71	.00	.00	.00	.00	175	611	577	539
15	530	210	60	.54	.00	.00	.00	.00	196	616	583	548
16	520	210	60	.47	.00	.00	.00	.00	216	616	579	542
17	500	200	55	.30	.00	.00	.00	.00	244	612	582	547
18	490	200	55	.21	.00	.00	.00	.00	270	618	580	514
19	470	190	50	.16	.00	.00	.00	.00	297	618	552	507
20	460	180	50	.05	.00	.00	.00	.00	314	623	560	493
21	440	160	50	.00	.00	.00	.00	.00	327	630	582	489
22	430	150	50	.00	.00	.00	.00	.00	347	614	573	494
23	410	130	45	.00	.00	.00	.00	.00	367	595	576	501
24	390	120	40	.00	.00	.00	.00	.12	392	611	593	505
25	380	110	35	.00	.00	.00	.00	.40	406	612	594	499
26	370	110	35	.00	.00	.00	.00	1.1	406	612	590	496
27	360	110	30	.00	.00	.00	.00	2.5	431	580	591	502
28	350	105	30	.00	.00	.00	.00	4.6	441	580	592	497
29	340	105	25	.00	---	.00	.00	8.4	458	590	591	482
30	320	100	25	.00	---	.00	.00	13	469	580	592	491
31	310	---	22	.00	---	.00	---	18	---	580	589	---
TOTAL	13842	5833	1812	120.43	.00	.00	.00	48.12	6984	18378	17990	15802
MEAN	447	194	58.5	3.88	.000	.000	.000	1.55	233	593	580	527
MAX	558	300	100	20	.00	.00	.00	18	469	630	600	584
MIN	310	100	22	.00	.00	.00	.00	.00	28	477	552	482
AC-FT	27460	11570	3590	239	.00	.00	.00	95	13850	36450	35680	31340

WTR YR 1983 TOTAL 80809.55 MEAN 221 MAX 630 MIN .00 AC-FT 160300

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05129400 RAINY LAKE NEAR FORT FRANCES, ONTARIO
(International gaging station)

LOCATION.--Lat 48°38'30", long 93°20'00", at Five Mile dock, approximately 5 mi (8 km) northeast of town of Fort Frances.

PERIOD OF RECORD.--January 1910 to September 1917 and October 1934 to current year, in reports of Geological Survey. August 1911 to September 1979, in reports of Water Survey of Canada. Prior to October 1949, published as "at Ranier, Minn.", and as "at Fort Frances, Ontario" October 1949 to September 1964.

GAGE.--Water-stage recorder. Datum of gage is at National Geodetic Vertical Datum of 1929 (United States and Canadian Boundary Survey). January 1910 to December 1949, nonrecording gage 3 mi (5 km) northeast at Ranier, Minn., at same datum. January 1950 to October 1964, water-stage recorder on Government dock at Pither's Point at Fort Frances and supplementary gage in town pumping station, 0.5 mi (0.8 km) south, used during winter months, at same datum.

COOPERATION.--This station is one of the international gaging stations maintained by Canada under agreement with the United States.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,112.97 ft (339.233 m) July 5, 1950; minimum observed, 1,101.26 ft (335.664 m) Apr. 17, 1923, Apr. 2, 1930.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,108.39 ft (337.837 m) July 4; maximum daily elevation, 1,108.25 ft (337.795 m) July 3, 4; minimum, 1,105.16 ft (336.853 m) Apr. 20; minimum daily, 1,105.19 ft (336.862 m) Apr. 22.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

Oct. 31 ..... 1107.76	Feb. 28 ..... 1105.97	June 30 ..... 1108.03
Nov. 30 ..... 1107.58	Mar. 31 ..... 1105.28	July 31 ..... 1108.16
Dec. 31 ..... 1106.99	Apr. 30 ..... 1105.32	Aug. 31 ..... 1107.89
Jan. 31 ..... 1106.38	May 31 ..... 1105.98	Sept.30 ..... 1107.42

NOTE.--Elevations other than those shown are available.

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05130500 STURGEON RIVER NEAR CHISHOLM, MN

LOCATION.--Lat 47°40'25", long 92°54'00", in NE¼NW¼ sec.20, T.60 N., R.20 W., St. Louis County, Hydrologic Unit 09030005, on left bank 1,000 ft (305 m) upstream from highway bridge, 0.6 mi (1.0 km) downstream from East Branch Sturgeon River, and 11.5 mi (18.5 km) north of Chisholm.

DRAINAGE AREA.--187 mi^2 (484 km^2).

PERIOD OF RECORD.--August 1942 to current year.

REVISED RECORDS.--WSP 1438: 1946.

GAGE.--Water-stage recorder. Datum of gage is 1,305.7 ft (397.977 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 24, 1944, nonrecording gage at site 1,000 ft (305 m) downstream at different datum. Aug. 25, 1944, to Sept. 30, 1975, at present site at datum 1.00 ft (0.305 m) higher.

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--41 years, 125 ft^3/s (3.540 m^3/s), 9.08 in/yr (231 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,630 ft^3/s (103 m^3/s) May 7, 1950, gage height, 7.41 ft (2.259 m), present datum, from rating curve extended above 1,600 ft^3/s (45.3 m^3/s) on basis of slope-area measurement of peak flow; minimum daily, 3.8 ft^3/s (0.11 m^3/s) Jan. 31 to Feb. 3, 1977.

EXTREMES FOR CURRENT YEAR.--Peak discharge above base of 500 ft^3/s (14.2 m^3/s) and maximum (*):

Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)
Oct. 9	1900	* 698	19.8	4.23	1.289
Nov. 21	2300	604	17.1	4.04	1.231
Nov. 23	1430	Ice jam	--	*4.56	1.390

Minimum daily discharge, 35 ft^3/s (0.99 m^3/s) Feb. 15.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	88	170	184	69	43	38	97	238	156	96	50	156
2	141	169	182	69	43	38	145	217	143	97	53	142
3	227	202	180	68	43	38	204	206	137	128	56	131
4	268	231	175	67	41	38	228	194	146	159	53	123
5	291	243	170	66	41	45	233	189	163	202	50	122
6	353	244	166	65	40	98	239	178	168	264	50	121
7	517	240	155	66	38	160	229	166	156	273	47	112
8	639	237	145	67	37	195	208	157	136	225	46	106
9	688	230	140	66	37	200	203	147	107	178	44	127
10	670	225	130	66	37	200	202	137	98	145	71	131
11	630	222	128	67	36	190	193	133	107	124	106	127
12	602	210	123	65	36	178	187	134	105	108	147	120
13	555	200	96	63	36	154	184	171	117	96	167	114
14	495	190	90	62	36	124	175	185	140	83	158	107
15	442	184	91	61	35	107	168	189	215	73	136	104
16	389	175	91	60	36	94	161	175	265	69	117	118
17	348	170	91	59	36	81	155	163	285	66	102	132
18	318	170	92	59	36	75	151	153	258	67	89	138
19	293	211	93	58	36	69	151	143	215	67	81	132
20	271	452	93	57	36	64	158	151	181	67	71	123
21	255	550	89	56	37	60	173	156	164	88	69	115
22	241	500	89	56	38	57	194	154	159	87	65	109
23	232	450	87	56	38	52	209	154	153	86	61	103
24	224	380	83	58	38	49	219	149	144	82	101	98
25	212	320	80	54	37	46	229	142	135	75	131	93
26	207	230	76	50	37	46	239	135	123	68	162	89
27	202	220	75	50	38	47	264	128	113	61	178	87
28	193	210	72	47	37	51	269	130	104	58	209	84
29	189	200	70	46	---	56	267	151	95	54	210	84
30	184	190	69	46	---	59	255	162	96	51	188	92
31	177	---	69	44	---	68	---	166	---	51	170	---
TOTAL	10541	7625	3474	1843	1059	2777	5989	5053	4584	3348	3238	3440
MEAN	340	254	112	59.5	37.8	89.6	200	163	153	108	104	115
MAX	688	550	184	69	43	200	269	238	285	273	210	156
MIN	88	169	69	44	35	38	97	128	95	51	44	84
CFSM	1.82	1.36	.60	.32	.20	.48	1.07	.87	.82	.58	.56	.62
IN.	2.10	1.52	.69	.37	.21	.55	1.19	1.01	.91	.67	.64	.68
AC-FT	20910	15120	6890	3660	2100	5510	11880	10020	9090	6640	6420	6820

CAL YR 1982	TOTAL	65343	MEAN 179	MAX 1160	MIN 19	CFSM .96	IN 13.00	AC-FT 129600			
WTR YR 1983	TOTAL	52971	MEAN 145	MAX 688	MIN 35	CFSM .78	IN 10.54	AC-FT 105100			

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN

LOCATION.--Lat 48°23'45", long 93°32'57", in NE¼SE¼ sec.9, T.68 N., R.25 W., Koochiching County, Hydrologic Unit 09030005, on right bank at town of Littlefork, 0.9 mi (1.4 km) upstream from bridge on State Highway 217, 2.8 mi (4.5 km) upstream from Beaver Creek, and 19 mi (31 km) upstream from mouth.

DRAINAGE AREA.--1,730 mi^2 (4,481 km^2), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June to November 1909, April to November 1910, April 1911 to June 1917, September 1917, October 1917 to March 1919 (gage heights only), June 1928 to current year.

REVISED RECORDS.--WSP 955: Drainage area. WSP 1508: 1913, 1916, 1928-32, 1934. WRD MN-74: 1963.

GAGE.--Water-stage recorder. Datum of gage is 1,083.59 ft (330.278 m) National Geodetic Vertical Datum of 1929. June 23, 1909, to Mar. 4, 1917, nonrecording gage and July 21, 1937, to Oct. 23, 1979, water-stage recorder at site 1.2 mi (1.9 km) downstream at datum 10.53 ft (3.210 m) lower; Mar. 5 to Sept. 30, 1917, and June 22, 1928, to July 20, 1937, nonrecording gage at site 1.18 mi (1.9 km) downstream at datum 10.53 ft (3.210 m) lower.

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--60 years (water years 1912-16, 1929-83), 1,053 ft^3/s (29.82 m^3/s), 8.27 in/yr (210 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 25,000 ft^3/s (708 m^3/s) Apr. 18, 1916, May 11, 1950, gage height, 37.00 ft (11.278 m) site and datum then in use; minimum observed, 21 ft^3/s (0.59 m^3/s) Aug. 26, 27, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,600 ft^3/s (159 m^3/s) Oct. 11, gage height, 8.35 ft (2.545 m); maximum gage height, 9.00 ft (2.743 m) Nov. 22, from graph based on gage readings (backwater from ice); minimum discharge, 155 ft^3/s (4.39 m^3/s) Aug. 9, gage height, 2.22 ft (0.677 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	426	1040	1800	310	210	180	700	1790	1240	677	206	1900
2	465	1020	1700	300	205	180	1000	1720	1230	687	198	1540
3	541	1010	1600	290	205	180	1500	1660	1200	777	195	1260
4	867	1140	1600	280	200	190	2000	1480	1120	1320	192	1030
5	1450	1280	1700	275	200	200	2200	1400	1090	1620	187	867
6	1680	1420	1700	270	200	400	2200	1320	1210	1760	182	800
7	2480	1560	1700	270	200	700	2100	1280	1450	1860	183	900
8	4380	1570	1650	265	195	1000	2000	1220	1420	1690	171	1000
9	4740	1570	1550	260	195	1700	1900	1170	1280	1450	159	1200
10	4920	1600	1500	260	195	2000	1800	1100	1100	1230	157	1250
11	5470	1590	1400	255	190	1700	1700	1040	925	986	158	1300
12	5500	1520	1300	255	190	1400	1600	1030	888	810	161	1200
13	5350	1030	1110	250	190	1200	1500	1100	1180	688	164	1100
14	5060	812	1000	250	190	1000	1400	1420	1730	599	205	1800
15	4570	1060	880	245	190	900	1290	1520	2660	521	280	1480
16	4020	1360	800	245	185	750	1240	1570	4340	460	290	1430
17	3460	1450	720	240	185	650	1120	1530	4820	434	290	1510
18	3010	1390	680	240	185	560	1120	1390	4350	399	279	1550
19	2680	1380	620	235	185	480	1030	1290	3540	411	261	1450
20	2410	1710	570	235	185	390	925	1220	2780	392	236	1300
21	2180	3890	530	230	180	350	895	1280	2150	375	249	1170
22	1980	5200	500	230	180	300	940	1340	1950	346	294	1030
23	1820	4800	470	225	180	270	1110	1430	2150	318	324	940
24	1690	4500	450	225	180	250	1270	1370	1900	291	448	867
25	1570	3700	430	220	180	230	1300	1270	1570	294	735	805
26	1460	3200	410	220	180	220	1300	1190	1300	289	1570	751
27	1380	3000	390	220	180	200	1380	1090	1070	268	2200	706
28	1300	2800	370	215	180	210	1560	1020	910	254	2230	677
29	1230	2500	350	215	---	230	1740	994	783	243	2350	638
30	1170	2200	330	210	---	300	1820	1070	702	230	2670	621
31	1090	---	320	210	---	450	---	1190	---	218	2410	---
TOTAL	80349	62302	30130	7650	5320	18770	43640	40494	54038	21897	19634	34072
MEAN	2592	2077	972	247	190	605	1455	1306	1801	706	633	1136
MAX	5500	5200	1800	310	210	2000	2200	1790	4820	1860	2670	1900
MIN	426	812	320	210	180	180	700	994	702	218	157	621
CFSM	1.50	1.20	.56	.14	.11	.35	.84	.76	1.04	.41	.37	.66
IN.	1.73	1.34	.65	.16	.11	.40	.94	.87	1.16	.47	.42	.73
AC-FT	159400	123600	59760	15170	10550	37230	86560	80320	107200	43430	38940	67580

CAL YR 1982 TOTAL 569445 MEAN 1560 MAX 12500 MIN 147 CFSM .90 IN 12.24 AC-FT 1129000
WTR YR 1983 TOTAL 418296 MEAN 1146 MAX 5500 MIN 157 CFSM .66 IN 8.99 AC-FT 829700

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1969, 1971, 1973 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1980 to September 1983 (discontinued).
WATER TEMPERATURES: October 1980 to September 1983 (discontinued).

INSTRUMENTATION.--Water-quality minimonitor October 1980 to September 1983.

REMARKS.--Letter K indicates non-ideal colony count. Extremes are published for those years with 80 percent or more record.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water years 1980-82): Maximum, 299 micromhos Feb. 21, 1981; minimum, 99 micromhos Apr. 30, May 1, 1981.
WATER TEMPERATURES (water years 1980-82): Maximum, 26.0°C July 7, 8, 12-14, 1981; minimum, 0.0°C several days during winter period.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	DISCHARGE, IN CUBIC FEET PER SECOND (00060)	STREAMFLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
NOV												
02...	1415	--	1050	113	101	7.6	7.2	7.0	5.0	7.5	728	12.4
FEB												
28...	1615	--	178	--	--	--	--	--	--	--	--	--
MAR												
01...	1430	170	--	232	234	7.5	7.5	6.5	.0	8.0	731	10.4
APR												
26...	0810	--	1410	130	125	7.8	7.0	14.0	9.0	33	721	11.4
AUG												
16...	1430	--	288	225	224	7.8	7.6	23.0	24.0	8.4	734	6.9

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)
NOV											
02...	102	K8	130	14	5.0	2.1	.70	43	17	2.2	<.10
FEB											
28...	--	<1	70	--	--	--	--	--	--	--	--
MAR											
01...	74	--	--	29	9.6	5.0	1.9	108	18	3.0	.20
APR											
26...	104	K5	300	14	4.7	2.3	1.8	50	10	3.1	<.10
AUG											
16...	85	22	67	30	9.9	5.6	1.6	105	12	3.4	.30

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV											
02...	7.7	115	<.100	.020	1.0	.040	.010	<.010	24	68	96
FEB											
28...	--	--	--	--	--	--	--	--	--	--	--
MAR											
01...	14	171	.310	.090	.60	.040	.020	.020	10	4.6	93
APR											
26...	5.2	131	.200	.090	.70	.070	.020	<.010	41	156	93
AUG											
16...	5.9	159	<.100	<.010	.70	.020	<.010	<.010	12	9.3	96

DATE	TIME	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
NOV											
02...	1415	100	3	32	<1	<1	6	<3	2	560	1
MAR											
01...	1430	90	2	37	<1	<1	10	<3	6	890	2
APR											
26...	0810	<10	2	25	<1	<1	<1	<3	2	370	3
AUG											
16...	1430	20	2	53	<0	<1	<1	<3	1	190	2

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
NOV										
02...	<4	16	.1	<10	<1	<1	--	35	<6	5
MAR										
01...	4	39	<.1	<10	1	<1	<1	85	<6	<3
APR										
26...	<4	17	<.1	<10	7	<1	<1	34	<6	<3
AUG										
16...	<4	5	<.1	<10	1	<1	<1	82	<6	10

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	136	133	134	115	114	115	110	106	107	200	196	198
2	139	134	137	114	112	113	116	111	113	203	196	200
3	139	135	137	113	112	112	118	116	117	203	194	196
4	135	132	133	113	111	112	121	118	119	198	197	197
5	138	132	134	112	111	111	124	122	123	200	197	199
6	159	139	148	112	110	111	125	124	124	206	200	204
7	164	153	156	113	110	112	127	125	126	207	205	206
8	152	143	150	112	109	110	130	128	128	208	206	207
9	146	129	137	110	108	109	133	129	131	220	207	213
10	129	125	126	110	107	108	135	132	133	223	209	221
11	124	122	123	110	108	109	138	135	136	223	221	222
12	122	119	121	112	109	110	141	137	139	224	222	223
13	119	117	118	118	112	116	145	141	143	226	224	225
14	117	116	116	121	118	119	150	146	148	227	225	226
15	115	113	114	123	120	121	152	150	151	228	226	227
16	112	110	111	122	120	121	154	152	153	229	227	228
17	112	109	110	123	120	121	160	154	157	229	220	225
18	114	111	113	124	122	123	165	159	162	229	220	222
19	115	113	114	139	121	128	170	165	167	229	220	224
20	115	113	114	142	132	137	174	171	173	229	220	221
21	116	113	114	139	119	130	177	173	175	229	220	221
22	116	114	115	118	99	109	180	176	179	223	221	222
23	117	115	116	98	80	85	183	180	181	225	221	222
24	119	116	117	79	72	76	184	173	176	224	222	223
25	119	117	118	80	76	78	176	174	175	225	223	224
26	120	118	119	89	79	84	177	176	176	226	223	22
27	120	118	119	94	89	91	179	177	178	227	224	226
28	120	117	118	97	94	96	180	178	179	229	226	227
29	119	117	118	101	97	99	194	180	190	[illegible]	227	228
30	119	117	118	106	101	104	196	194	195	241	228	234
31	117	115	116	---	---	---	196	194	195	243	240	241
MONTH	164	109	124	142	72	109	196	106	153	243	194	219

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	244	242	243									
2	245	240	243									
3	245	241	243									
4	247	242	244									
5	249	240	244									
6	249	240	246									
7	249	240	244									
8	249	240	241									
9	243	241	242									
10	245	243	243									
11	246	243	244									
12	246	244	245									
13	247	245	246									
14	247	245	246									
15	247	245	246									
16	247	245	246									
17	245	244	245									
18	245	244	245									
19	245	244	245									
20	245	244	244									
21	245	244	244									
22	246	244	245									
23	246	244	245									
24	247	246	246									
25	248	246	247									
26	248	246	247									
27	247	245	246									
28	246	244	245									
29	---	---	---									
30	---	---	---									
31	---	---	---									
MONTH	249	240	245									

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	12.5	11.5	12.0	5.5	5.0	5.5	.0	.0	.0	.0	.0	.0
2	11.5	11.0	11.5	5.0	[illegible]	5.0	.0	.0	.0	.0	.0	.0
3	12.0	10.5	11.0	4.5	[illegible]	3.5	.0	.0	.0	.0	.0	.0
4	12.0	11.0	11.5	2.5	1.5	2.0	.0	.0	.0	.0	.0	.0
5	11.5	11.0	11.0	1.5	1.0	1.5	.0	.0	.0	.0	.0	.0
6	11.0	10.0	10.5	1.0	.5	1.0	.0	.0	.0	.0	.0	.0
7	10.0	9.5	10.0	.5	.5	.5	.0	.0	.0	.0	.0	.0
8	10.0	9.5	10.0	.5	.5	.5	.0	.0	.0	.0	.0	.0
9	9.5	9.5	9.5	.5	.0	.5	.0	.0	.0	.0	.0	.0
10	9.5	9.0	9.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	9.5	9.0	9.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
12	9.5	9.5	9.5	.5	.0	.0	.0	.0	.0	.0	.0	.0
13	9.5	9.5	9.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	9.5	9.0	9.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	9.5	9.0	9.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	9.0	8.0	8.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	8.0	7.5	8.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	7.5	7.5	7.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	7.5	6.5	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	6.5	6.0	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	6.0	5.5	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	5.5	5.0	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	5.0	4.5	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	5.5	4.5	5.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	5.5	5.0	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	6.0	5.5	5.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	6.5	6.0	6.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	7.0	6.5	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	7.5	7.0	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	7.0	6.0	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
31	6.0	5.5	5.5	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	12.5	4.5	8.0	5.5	.0	.5	.0	.0	.0	.0	.0	.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0									
2	.0	.0	.0									
3	.0	.0	.0									
4	.0	.0	.0									
5	.0	.0	.0									
6	.0	.0	.0									
7	.0	.0	.0									
8	.0	.0	.0									
9	.0	.0	.0									
10	.0	.0	.0									
11	.0	.0	.0									
12	.0	.0	.0									
13	.0	.0	.0									
14	.0	.0	.0									
15	.0	.0	.0									
16	.0	.0	.0									
17	.0	.0	.0									
18	.0	.0	.0									
19	.0	.0	.0									
20	.0	.0	.0									
21	.0	.0	.0									
22	.0	.0	.0									
23	.0	.0	.0									
24	.0	.0	.0									
25	.0	.0	.0									
26	.0	.0	.0									
27	.0	.0	.0									
28	.0	.0	.0									
29	---	---	---									
30	---	---	---									
31	---	---	---									
MONTH	.0	.0	.0									

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05132000 BIG FORK RIVER AT BIG FALLS, MN

LOCATION.--Lat 48°11'45", long 93°48'25", in SW¼SE¼ sec.35, T.155 N., R.25 W., Koochiching County, Hydrologic Unit 09030006, on left bank at village of Big Falls, 700 ft (213 m) downstream from falls, 0.3 mi (0.5 km) downstream from bridge on U.S. Highway 71, and 4.8 mi (7.7 km) upstream from Sturgeon River.

DRAINAGE AREA.--1,460 mi^2 (3,780 km^2), approximately.

PERIOD OF RECORD.--August to November 1909, April to November 1910, April 1911 to September 1912 (gage heights and discharge measurements only), June 1928 to September 1979. October 1979 to September 1982, annual maximums only. October 1982 to September 1983.

REVISED RECORDS.--WSP 1308: 1935(M).

GAGE.--Water-stage recorder. Datum of gage is 1,144.71 ft (348.908 m) National Geodetic Vertical Datum of 1929. Prior to June 10, 1911, nonrecording gage at railroad bridge about 0.4 mi (0.6 km) upstream at different datum. June 10, 1911, to Sept. 30, 1912, and June 22, 1928, to Dec. 17, 1937, nonrecording gage at site 200 ft (61 m) upstream at same datum. October 1979 to September 1982, crest-stage gage at same site and datum.

REMARKS.--Records good except those for period of no gage height record (Dec. 31 to Apr. 10), which are fair. Prior to 1971, a powerplant, located 0.3 mi (0.5 km) upstream, caused some diurnal fluctuation at low flows.

AVERAGE DISCHARGE.--52 years (water years 1929-79, 1983), 715 ft^3/s (20.25 m^3/s), 6.65 in/yr (169 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,800 ft^3/s (419 m^3/s) May 8, 9, 1950; maximum gage height, 17.08 ft (5.206 m) May 8, 1950; minimum discharge recorded, 7 ft^3/s (0.20 m^3/s) Aug. 7, 1939.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,790 ft^3/s (192 m^3/s) June 16, gage height, 10.47 ft (3.191 m); minimum daily, 203 ft^3/s (5.75 m^3/s) Mar. 2-4; minimum gage height, 3.14 ft (0.957 m) Aug. 10.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	349	1000	921	330	240	205	600	804	810	837	279	1290
2	384	970	935	320	235	203	800	798	772	784	274	1120
3	475	998	977	310	235	203	1200	772	765	935	274	1000
4	552	1050	991	305	235	203	1500	752	784	1140	274	886
5	570	1080	970	300	230	210	1600	739	804	1190	261	824
6	648	1070	900	300	230	300	1600	720	798	1120	243	824
7	1240	1030	850	295	230	400	1500	706	752	1030	231	817
8	1950	1020	800	290	230	600	1400	694	674	914	222	791
9	1880	1030	750	290	230	1100	1300	661	616	810	210	928
10	2120	1030	700	285	225	1300	1200	622	552	726	210	956
11	2480	1030	660	280	225	1100	1060	616	509	654	218	928
12	2560	956	630	280	225	1000	1040	635	533	583	231	858
13	2530	810	600	275	225	900	928	784	824	540	261	804
14	2400	680	570	275	225	800	739	977	1440	496	270	772
15	2190	674	540	270	220	700	706	1100	3490	455	261	804
16	1990	900	520	270	220	650	700	1100	6540	426	252	1060
17	1810	928	500	265	220	600	668	1020	5980	404	248	1150
18	1700	914	480	265	220	550	635	928	4780	389	239	1150
19	1600	921	460	265	220	500	328	872	3680	384	243	1090
20	1520	1100	450	260	215	450	635	886	2730	369	243	1010
21	1450	1860	440	260	215	400	642	935	2080	359	335	935
22	1380	2100	430	260	215	370	654	1000	1990	344	509	879
23	1300	1900	420	255	215	340	668	1030	2130	340	509	817
24	1240	1750	400	255	215	310	687	970	2010	335	984	765
25	1190	1600	390	250	210	290	746	914	1800	321	1640	720
26	1160	1450	380	250	210	280	772	844	1550	306	1780	680
27	1140	1300	370	250	210	270	772	784	1290	311	1770	648
28	1100	1200	360	245	210	270	791	765	1080	302	1630	616
29	1080	1100	360	245	---	280	824	765	928	293	1650	590
30	1060	1000	350	240	---	300	824	791	865	288	1680	590
31	1030	---	340	240	---	350	---	817	---	284	1490	---
TOTAL	44078	34451	18444	8480	6235	15434	27519	25801	53556	17669	18921	26302
MEAN	1422	1148	595	274	223	498	917	832	1785	570	610	877
MAX	2560	2100	991	330	240	1300	1600	1100	6540	1190	1780	1290
MIN	349	674	340	240	210	203	328	616	509	284	210	590
CFSM	.97	.79	.41	.19	.15	.34	.63	.57	1.22	.39	.42	.60
IN.	1.12	.88	.47	.22	.16	.39	.70	.66	1.36	.45	.48	.67
AC-FT	87430	68330	36580	16820	12370	30610	54580	51180	106200	35050	37530	52170

WTR YR 1983 TOTAL 296890 MEAN 813 MAX 6540 MIN 203 CFSM .56 IN 7.56 AC-FT 588900

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN

(International gaging station)

LOCATION.--Lat 48°38'04", long 93°54'47", in NW¼SE¼ sec.36, T.160 N., R.26 W., Koochiching County, Hydrologic Unit 09030004, on left bank at Manitou Rapids, 4 mi (6 km) west of Indus.

DRAINAGE AREA.--19,400 mi^2 (50,200 km^2), approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1928 to current year. Monthly discharge only for some periods, published in WSP 1308. October 1911 to October 1924 (gage heights only) at site near Birchdale in files of Corps of Engineers. Published as "near Birchdale" 1932-34.

GAGE.--Water-stage recorder. Datum of gage is 1,062.48 ft (323.844 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 10, 1934, nonrecording gage at site near Birchdale 7 mi (11 km) downstream at different datum.

REMARKS.--Records good. Diurnal fluctuation caused by powerplant at International Falls. Some regulation at low and medium flows by Rainy and Namakan Lakes.

COOPERATION.--This station is one of the international gaging stations maintained by the United States under agreement with Canada.

AVERAGE DISCHARGE.--55 years, 12,830 ft^3/s (363.3 m^3/s), 8.98 in/yr (228 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 71,600 ft^3/s (2,030 m^3/s) May 12, 1950, gage height, 21.04 ft (6.413 m); minimum daily, 928 ft^3/s (26.3 m^3/s) Dec. 26, 1929.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 29,100 ft^3/s (824 m^3/s) Oct. 20, gage height, 11.76 ft (3.584 m); maximum gage height, 16.27 ft (4.959 m) occurred during period Nov. 26 to Dec. 1, from highwater mark (backwater from ice); minimum discharge, 5,960 ft^3/s (169 m^3/s) June 13, gage height, 3.20 ft (0.975 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7940	22700	27500	15000	11000	10500	12200	9050	7020	14000	14100	15200
2	8190	21100	27200	15000	11000	11000	13000	9180	7010	13900	14100	14000
3	8370	20400	27100	15000	11000	11000	13700	9150	6960	16800	14100	13400
4	8480	20400	26000	15000	11000	11000	14100	9120	6940	20500	14000	12900
5	8960	20600	25700	15000	11000	11000	15100	8870	6940	24200	14000	12100
6	9980	22300	25400	15000	11000	11000	15100	8610	6920	25300	13900	10800
7	11900	23000	25000	15000	11000	11500	15000	8360	7130	25200	13700	11300
8	13500	23200	24000	15000	11000	11800	14900	8490	7100	24800	13200	11600
9	15900	23200	23000	15000	11000	12000	14500	8340	6940	24200	11100	12800
10	18000	23400	22000	15000	11000	14000	14200	8450	6680	23600	10100	13400
11	20200	25000	21200	15000	11000	14000	14000	7470	6350	22900	9410	14200
12	21900	25600	20800	15000	11000	13000	13900	6580	6100	21500	9260	14300
13	25400	25200	20400	15000	11000	12500	13700	6380	6020	17800	9160	14100
14	26100	24500	20000	15000	11000	12500	13200	6770	7400	16100	9110	13700
15	26000	24100	19800	15000	11000	12200	12900	7490	11000	15200	9170	13200
16	27000	24200	19600	15000	11000	12100	12700	7780	15700	14800	9310	13000
17	26700	24000	19500	15000	11000	12000	12600	7870	20200	14600	9380	13900
18	26400	21200	19200	15000	11000	11800	12400	7760	21000	14500	9370	15000
19	28600	20200	19000	15000	11000	11700	12000	7420	19600	14500	9330	15100
20	29000	20700	19000	15000	11000	11500	11600	7180	17200	14900	9390	14300
21	28000	21800	19000	15000	11000	11400	11100	7060	14900	15100	9500	13500
22	25200	23600	19500	14500	11000	11400	10800	7120	14700	15100	9470	12900
23	24400	25300	19500	13500	11000	11300	9670	7400	17600	15000	9560	12600
24	24300	26900	17000	13000	11000	11300	9050	7540	18800	14900	9910	12700
25	24000	27900	13500	12000	11000	11200	9060	7510	18700	14500	10500	12700
26	23600	29000	13000	11500	11000	11100	8610	7340	17900	12200	11700	12400
27	23400	29000	15000	11500	10500	11100	8420	7160	16900	11200	13400	11600
28	23300	29000	14800	11000	10500	11100	8510	6860	15800	10800	14700	11100
29	23100	28500	14800	11000	---	11200	8480	6710	14900	10800	15100	11200
30	23100	28000	14600	11000	---	11200	8750	6660	14400	13000	15500	11200
31	23000	---	14500	11000	---	11400	---	6870	---	14000	15800	---
TOTAL	633920	724000	626600	435000	307000	361800	363250	238550	364810	525900	360330	390200
MEAN	20450	24130	20210	14030	10960	11670	12110	7695	12160	16960	11620	13010
MAX	29000	29000	27500	15000	11000	14000	15100	9180	21000	25300	15800	15200
MIN	7940	20200	13000	11000	10500	10500	8420	6380	6020	10800	9110	10800
CFSM	1.05	1.24	1.04	.72	.57	.60	.62	.40	.63	.87	.60	.67
IN.	1.22	1.39	1.20	.83	.59	.69	.70	.46	.70	1.01	.69	.75
AC-FT	1257000	1436000	1243000	862800	608900	717600	720500	473200	723600	1043000	714700	774000

CAL YR 1982 TOTAL 6041210 MEAN 16550 MAX 37700 MIN 6800 CFSM .85 IN 11.58 AC-FT 11980000
WTR YR 1983 TOTAL 5331360 MEAN 14610 MAX 29000 MIN 6020 CFSM .75 IN 10.22 AC-FT 10570000

BEST COPY AVAILABLE

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1968-70, October 1977 to current year.

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1980 to September 1983 (discontinued).
WATER TEMPERATURES: October 1980 to September 1983 (discontinued).

INSTRUMENTATION.--Water-quality minimonitor October 1980 to September 1983.

REMARKS.--Letter K indicates non-ideal colony count. Extremes are published for those years with 80 percent or more record.

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum, 166 micromhos July 2, 1982; minimum, 60 micromhos Dec. 11, 1982.
WATER TEMPERATURES (water years 1980-82): Maximum, 25.0°C July 18, Aug. 14, 1981; minimum, 0.0°C several days during winter period.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 151 micromhos Oct. 7; minimum, 60 micromhos Dec. 11.

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	DISCHARGE, IN CUBIC FEET PER SECOND (00060)	STREAMFLOW, INSTANTANEOUS (CFS) (00061)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE, AIR (DEG C) (00020)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
NOV												
02...	0930	--	21200	88	72	7.5	7.0	5.0	6.5	3.5	729	11.4
JAN												
04...	1345	15000	--	80	27	7.3	7.3	-5.0	.0	1.4	719	--
MAR												
01...	0900	10500	--	93	65	7.0	7.6	-5.0	.0	1.7	732	11.8
APR												
26...	1300	--	8620	124	97	7.4	6.9	14.0	9.0	7.5	721	11.7
JUN												
22...	1200	--	14400	135	127	7.5	7.3	22.0	18.0	14	730	7.4
AUG												
16...	0930	--	9290	100	72	7.6	6.8	16.0	22.0	1.7	736	6.5

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)
NOV											
02...	97	340	140	8.3	2.7	2.1	.40	26	12	2.1	<.10
JAN											
04...	--	130	70	6.8	2.3	1.7	.60	20	11	1.8	<.10
MAR											
01...	84	K6000	260	7.3	2.0	2.7	.80	21	10	3.6	<.10
APR											
26...	107	150	400	11	3.3	3.0	1.0	37	11	2.8	<.10
JUN											
22...	82	K660	>1000	19	6.4	2.0	.80	60	17	2.6	<.10
AUG											
16...	77	K19	340	8.1	2.3	3.5	.70	24	9.4	4.2	<.10

DATE	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS, ORTHO, DISSOLVED (MG/L AS P) (00671)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV											
02...	3.0	82	<.100	<.010	.40	.030	<.010	<.010	18	1030	88
JAN											
04...	2.7	50	.150	.100	.40	.020	.010	<.010	7	283	95
MAR											
01...	2.8	59	.140	.050	.40	.020	.010	.010	1	28	92
APR											
26...	3.1	97	<.100	.020	.50	.030	<.010	<.010	8	186	90
JUN											
22...	5.7	121	<.100	.050	1.1	.120	.040	.010	69	2680	97
AUG											
16...	2.4	49	<.100	<.010	.70	.030	.030	<.010	8	201	79

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)
MAR											
01...	0900	60	2	19	1	1	10	3	13	72	4
APR											
26...	1300	<10	2	22	<1	<1	<1	<3	2	140	2
JUN											
22...	1200	120	2	41	<0	<1	4	<3	4	250	1
AUG											
16...	0930	20	2	41	<0	<1	<1	<3	2	59	2

DATE	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
MAR										
01...	4	5	.2	10	1	<1	<1	23	6	3
APR										
26...	<4	12	<.1	<10	6	<1	<1	28	<6	3
JUN										
22...	5	37	.3	<10	3	<1	<1	35	<6	12
AUG										
16...	<4	2	<.1	<10	1	<1	<1	24	<6	<3

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	120	118	119	87	85	86	68	63	66	83	81	82
2	130	118	123	90	85	88	66	64	65	82	81	82
3	123	119	121	89	88	88	68	65	67	83	81	82
4	123	120	122	88	87	87	70	66	68	82	80	81
5	128	122	126	89	88	88	68	66	67	83	80	82
6	139	127	130	87	83	85	71	67	68	83	80	82
7	151	136	144	84	82	83	81	73	78	85	81	83
8	137	134	136	83	79	81	93	80	88	83	80	81
9	138	128	132	81	79	80	96	92	95	81	80	80
10	136	126	132	80	77	79	92	64	76	82	80	81
11	126	116	120	78	75	76	63	60	61	83	81	82
12	117	110	113	75	72	74	64	61	62	85	82	83
13	110	104	106	74	72	73	65	64	64	84	78	80
14	106	99	103	71	68	70	66	65	66	85	78	81
15	101	98	100	68	66	67	68	66	67	85	80	82
16	98	94	96	67	65	67	69	68	68	82	81	82
17	94	92	93	71	67	69	70	68	69	86	82	84
18	93	89	92	79	71	77	71	69	71	83	81	82
19	90	86	87	79	77	77	73	70	71	83	81	82
20	87	83	85	86	78	82	72	70	71	83	81	82
21	83	81	82	85	82	84	73	71	72	83	81	83
22	87	84	86	86	82	84	73	71	72	91	82	86
23	88	83	85	87	82	85	77	70	72	91	90	91
24	84	82	83	82	79	80	92	77	85	90	88	89
25	85	82	84	86	82	84	96	92	100	96	89	92
26	85	82	84	89	84	87	104	101	103	97	94	95
27	85	83	84	90	85	88	103	83	94	94	92	93
28	86	84	85	85	65	79	86	83	84	95	92	93
29	88	86	87	66	64	65	88	85	87	94	90	92
30	88	86	87	67	64	65	85	84	85	91	89	90
31	87	86	87	---	---	---	85	82	83	90	89	89
MONTH	151	81	104	90	64	79	104	60	76	97	78	85

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

SPECIFIC CONDUCTANCE (MICROMHOS/CM AT 25 DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	90	88	89	87	86	87	96	91	93	115	112	114
2	90	87	89	86	85	85	98	93	95	114	112	113
3	88	87	87	86	84	85	96	91	92	112	110	111
4	89	87	88	86	85	86	93	91	92	111	108	110
5	88	86	87	93	85	88	91	89	90	111	107	109
6	89	87	88	91	85	88	89	88	89	111	108	109
7	89	88	89	96	86	91	89	87	88	112	108	110
8	89	87	88	96	94	95	87	85	86	113	109	111
9	88	87	88	97	93	95	89	84	86	112	109	111
10	88	86	87	104	94	99	88	85	87	112	108	110
11	87	85	86	108	104	106	90	85	88	112	109	110
12	87	86	87	107	96	102	92	88	90	117	112	114
13	87	85	86	94	90	92	92	91	91	---	---	---
14	85	83	84	91	83	88	91	88	90	---	---	---
15	86	84	85	84	83	83	89	86	87	---	---	---
16	86	84	85	84	82	83	89	83	86	---	---	---
17	86	82	84	84	82	83	91	87	89	---	---	---
18	83	81	82	85	83	84	95	89	92	---	---	---
19	83	82	82	84	83	84	98	93	95	---	---	---
20	83	81	82	86	83	84	100	97	99	---	---	---
21	82	81	82	91	84	88	102	96	99	---	---	---
22	81	80	81	92	86	89	105	100	102	---	---	---
23	81	80	81	89	83	86	109	104	106	---	---	---
24	81	79	81	85	83	84	113	109	111	---	---	---
25	82	79	80	88	84	85	113	110	111	---	---	---
26	83	80	81	88	85	87	112	110	111	---	---	---
27	84	83	83	87	84	85	110	109	110	---	---	---
28	86	83	85	89	86	87	112	109	111	---	---	---
29	---	---	---	92	88	89	114	110	112	---	---	---
30	---	---	---	92	89	91	114	112	113	---	---	---
31	---	---	---	92	89	90	---	---	---	---	---	---
MONTH	90	79	85	108	82	89	114	83	96	---	---	---

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	91	89	90	94	87	91	104	100	102
2	---	---	---	91	87	89	96	85	88	104	102	103
3	---	---	---	92	88	90	90	86	88	106	103	104
4	---	---	---	90	86	89	94	84	91	105	103	104
5	---	---	---	86	81	83	92	85	90	104	100	102
6	---	---	---	82	78	80	90	81	85	106	101	104
7	---	---	---	82	77	79	84	80	82	103	99	101
8	---	---	---	82	79	81	91	80	85	105	99	101
9	---	---	---	82	77	79	97	79	91	115	107	110
10	---	---	---	79	74	76	99	91	93	111	107	109
11	---	---	---	77	72	74	104	95	99	108	106	107
12	---	---	---	79	75	77	101	93	97	105	100	103
13	---	---	---	81	78	80	96	90	93	103	100	101
14	---	---	---	80	78	79	102	91	94	101	96	98
15	---	---	---	81	78	79	100	93	95	96	94	95
16	---	---	---	91	78	84	99	92	96	97	95	96
17	---	---	---	92	80	85	110	99	103	111	96	100
18	---	---	---	90	80	84	106	98	103	112	101	107
19	---	---	---	93	79	85	104	95	97	101	96	98
20	---	---	---	97	87	89	102	96	98	98	96	97
21	---	---	---	95	88	90	100	96	98	100	98	99
22	---	---	---	92	88	90	105	100	103	99	97	98
23	---	---	---	95	87	91	109	104	105	98	97	97
24	---	---	---	92	81	85	125	110	116	98	95	96
25	---	---	---	91	81	88	132	126	129	96	94	95
26	---	---	---	102	90	98	133	126	129	96	94	95
27	---	---	---	104	96	99	125	106	112	98	95	97
28	---	---	---	104	98	101	115	108	113	102	98	101
29	91	87	89	105	94	100	116	109	112	102	98	100
30	93	89	91	98	81	86	113	107	110	105	99	101
31	---	---	---	91	80	88	108	103	105	---	---	---
MONTH	---	---	---	105	72	86	133	79	100	115	94	101

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	12.0	11.0	11.5	7.0	6.5	7.0	.5	.0	.5	.0	.0	.0
2	11.5	11.0	11.5	7.0	6.0	6.5	1.0	.5	.5	.0	.0	.0
3	12.5	10.5	11.5	6.0	5.0	5.5	1.0	.5	1.0	.0	.0	.0
4	12.5	11.0	12.0	5.0	4.0	4.5	.5	.5	.5	.0	.0	.0
5	12.0	11.0	11.5	4.0	3.5	3.5	.5	.5	.5	.0	.0	.0
6	11.0	9.5	10.0	3.5	3.5	3.5	.5	.0	.0	.0	.0	.0
7	10.0	9.5	10.0	4.0	3.5	3.5	.0	.0	.0	.0	.0	.0
8	10.5	10.0	10.0	3.5	3.0	3.5	.0	.0	.0	.0	.0	.0
9	10.0	9.5	9.5	3.5	3.0	3.0	.0	.0	.0	.0	.0	.0
10	10.0	9.5	9.5	3.0	3.0	3.0	.0	.0	.0	.0	.0	.0
11	9.5	9.5	9.5	3.0	3.0	3.0	.0	.0	.0	.0	.0	.0
12	9.5	9.5	9.5	3.0	2.0	2.0	.0	.0	.0	.0	.0	.0
13	10.0	9.5	9.5	2.0	1.5	1.5	.0	.0	.0	.0	.0	.0
14	10.0	9.5	9.5	1.5	1.0	1.5	.0	.0	.0	.0	.0	.0
15	9.5	9.0	9.5	1.5	1.5	1.5	.0	.0	.0	.0	.0	.0
16	9.0	9.0	9.0	1.5	1.0	1.5	.0	.0	.0	.0	.0	.0
17	9.0	8.5	8.5	1.5	1.5	1.5	.0	.0	.0	.0	.0	.0
18	8.5	8.5	8.5	1.5	1.0	1.0	.0	.0	.0	.0	.0	.0
19	8.5	8.0	8.0	1.5	1.5	1.5	.0	.0	.0	.0	.0	.0
20	8.0	7.0	7.5	2.0	1.5	2.0	.0	.0	.0	.0	.0	.0
21	7.0	7.0	7.0	1.0	.0	.5	.0	.0	.0	.0	.0	.0
22	7.0	6.5	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	7.0	6.5	6.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	7.0	6.5	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	7.5	7.0	7.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	8.0	7.5	7.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	8.0	7.5	8.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	8.0	8.0	8.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	8.0	8.0	8.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
30	8.0	7.0	7.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
31	7.0	7.0	7.0	---	---	---	.0	.0	.0	.0	.0	.0
MONTH	12.5	6.5	9.0	7.0	.0	2.0	1.0	.0	.0	.0	.0	.0

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	.0	.0	.0	.0	.0	.0	1.5	1.0	1.5	10.5	6.0	8.0
2	.0	.0	.0	.0	.0	.0	2.0	1.0	1.5	11.5	7.5	9.0
3	.0	.0	.0	.0	.0	.0	2.0	1.0	1.5	11.0	8.0	9.0
4	.0	.0	.0	.0	.0	.0	2.5	1.0	1.5	11.0	7.5	9.0
5	.0	.0	.0	.0	.0	.0	2.5	1.0	1.5	11.5	8.0	9.5
6	.0	.0	.0	.0	.0	.0	2.0	1.0	1.5	12.0	8.0	10.0
7	.0	.0	.0	.0	.0	.0	2.5	1.0	1.5	12.5	8.0	10.0
8	.0	.0	.0	.0	.0	.0	3.0	1.0	2.0	13.0	8.0	10.5
9	.0	.0	.0	.0	.0	.0	2.5	1.5	2.0	12.5	9.0	11.0
10	.0	.0	.0	.0	.0	.0	2.5	1.5	2.0	12.0	10.0	11.0
11	.0	.0	.0	.0	.0	.0	3.5	1.5	2.5	11.5	10.5	11.0
12	.0	.0	.0	.0	.0	.0	3.0	2.0	2.5	13.0	10.0	11.5
13	.0	.0	.0	.0	.0	.0	2.5	1.5	2.0	---	---	---
14	.0	.0	.0	.5	.0	.0	1.5	1.0	1.0	---	---	---
15	.0	.0	.0	.0	.0	.0	3.0	.5	1.5	---	---	---
16	.0	.0	.0	.5	.0	.0	3.5	1.5	2.0	---	---	---
17	.0	.0	.0	1.0	.5	.5	4.5	2.0	3.0	---	---	---
18	.0	.0	.0	1.0	.5	.5	5.5	2.5	4.0	---	---	---
19	.0	.0	.0	1.0	.0	.5	6.0	3.0	4.5	---	---	---
20	.0	.0	.0	1.0	.0	.0	7.0	4.0	5.5	---	---	---
21	.0	.0	.0	.5	.0	.0	8.0	5.0	6.0	---	---	---
22	.0	.0	.0	.5	.0	.0	8.5	5.5	7.0	---	---	---
23	.0	.0	.0	1.5	.0	.5	9.5	5.5	7.5	---	---	---
24	.0	.0	.0	2.0	.0	1.0	10.5	6.0	8.5	---	---	---
25	.0	.0	.0	2.5	.5	1.5	11.5	7.5	9.5	---	---	---
26	.0	.0	.0	2.0	1.5	1.5	10.5	9.0	9.5	---	---	---
27	.0	.0	.0	2.5	1.5	2.0	9.5	8.0	8.5	---	---	---
28	.0	.0	.0	3.5	1.0	2.0	8.0	7.0	7.5	---	---	---
29	---	---	---	3.0	1.5	2.5	7.0	6.0	6.5	---	---	---
30	---	---	---	2.5	2.0	2.5	9.0	5.0	7.0	---	---	---
31	---	---	---	2.0	1.5	2.0	---	---	---	---	---	---
MONTH	.0	.0	.0	3.5	.0	.5	11.5	.5	4.0	---	---	---

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05134200 RAPID RIVER NEAR BAUDETTE, MN

LOCATION.--Lat 48°32'10", long 94°33'45", in SE¼NE¼ sec.1, T.158 N., R.31 W., Lake of the Woods County, Hydrologic Unit 09030007, on left bank 20 ft (6 m) upstream from bridge on State Highway 72, 1.2 mi (1.9 km) downstream from North Branch Rapid River, and 12 mi (19 km) south of Baudette.

DRAINAGE AREA.--543 mi^2 (1,406 km^2).

PERIOD OF RECORD.--October 1956 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,093.92 ft (333.427 m) National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation bench mark).

REMARKS.--Records good except those for winter period, which are fair.

AVERAGE DISCHARGE.--27 years, 316 ft^3/s (8.949 m^3/s), 7.90 in/yr (201 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,550 ft^3/s (214 m^3/s) Apr. 26, 1979, gage height, 21.13 ft (6.440 m); no flow Dec. 20, 1976 to Mar. 9, 1977.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of May 11, 1950, reached a stage of 21.1 ft (6.431 m), from information by local residents and Minnesota Department of Transportation, discharge, about 7,500 ft^3/s (210 m^3/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,430 ft^3/s (97.1 m^3/s) Oct. 12, gage height, 12.83 ft (3.911 m); minimum daily discharge, 12 ft^3/s (0.34 m^3/s) Feb. 12 to Mar. 3; minimum gage height, 2.10 ft (0.640 m) Aug. 20.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	940	807	160	32	14	12	180	382	354	656	65	695
2	1030	766	180	31	14	12	300	358	328	645	61	595
3	1180	748	200	30	14	12	600	343	324	1130	56	495
4	1130	730	230	29	13	13	1000	335	339	1440	53	398
5	1030	692	210	28	13	20	1000	317	324	1360	50	318
6	1130	657	190	27	13	50	950	305	320	1180	47	272
7	1920	633	170	26	13	150	900	302	273	1000	41	247
8	2230	629	150	26	13	400	800	286	251	847	34	234
9	2260	598	135	25	13	450	750	280	227	698	31	600
10	2700	571	120	24	13	450	680	267	217	582	32	815
11	3260	571	110	23	13	430	650	287	208	492	30	768
12	3390	516	100	23	12	400	613	326	207	412	30	706
13	3220	419	90	22	12	380	578	401	208	342	24	626
14	2990	500	85	21	12	350	560	454	329	289	23	558
15	2710	450	80	20	12	320	518	441	612	240	21	542
16	2400	420	75	20	12	280	480	408	684	206	20	834
17	2140	390	70	19	12	260	448	375	665	190	18	1010
18	1940	360	65	19	12	230	405	357	592	174	17	1450
19	1800	350	60	18	12	210	378	346	511	160	16	1500
20	1670	400	55	18	12	200	360	339	443	156	14	1340
21	1530	370	50	17	12	180	360	345	555	154	28	1190
22	1400	340	48	17	12	170	358	368	1660	141	65	1080
23	1300	310	46	17	12	160	352	402	1970	121	87	959
24	1210	290	43	16	12	150	338	373	1600	107	153	847
25	1150	260	41	16	12	140	340	353	1320	97	358	753
26	1080	240	40	16	12	135	358	328	1130	84	392	664
27	1020	220	38	15	12	130	385	304	911	76	408	598
28	988	200	37	15	12	130	403	297	712	72	465	542
29	956	180	35	15	---	135	393	360	572	70	695	512
30	914	170	34	14	---	140	392	389	555	65	860	480
31	860	---	33	14	---	150	---	378	---	69	806	---
TOTAL	53478	13787	2980	653	350	6249	15829	10806	18401	13255	5000	21628
MEAN	1725	460	96.1	21.1	12.5	202	528	349	613	428	161	721
MAX	3390	807	230	32	14	450	1000	454	1970	1440	860	1500
MIN	860	170	33	14	12	12	180	267	207	65	14	234
CFSM	3.18	.85	.18	.04	.02	.37	.97	.64	1.13	.79	.30	1.33
IN.	3.66	.94	.20	.04	.02	.43	1.08	.74	1.26	.91	.34	1.48
AC-FT	106100	27350	5910	1300	694	12390	31400	21430	36500	26290	9920	42900

CAL YR 1982 TOTAL 180440 MEAN 494 MAX 3700 MIN 14 CFSM .91 IN 12.36 AC-FT 357900
WTR YR 1983 TOTAL 162416 MEAN 445 MAX 3390 MIN 12 CFSM .82 IN 11.13 AC-FT 322200

BEST COPY AVAILABLE

LAKE OF THE WOODS BASIN

05140520 LAKE OF THE WOODS AT WARROAD, MN

(International gaging station)

LOCATION.--Lat 48°54'15", long 95°18'57", in SW¼SE¼ sec.29, T.163 N., R.36 W., Roseau County, Hydrologic Unit 09030009, on left bank of Warroad River in Warroad, 300 ft (91 m) downstream from Canadian National railroad bridge, 1,000 ft (305 m) downstream from bridge on State Highway 11, and 4,000 ft (1,200 m) upstream from mouth of Warroad River.

DRAINAGE AREA.--27,200 mi^2 (70,400 km^2).

PERIOD OF RECORD.--April to September 1978 (monthend elevations only), October 1978 to current year. Records collected prior to April 1978 are in reports of the Water Survey of Canada.

GAGE.--Water-stage recorder. Datum of gage is 1,000.00 ft (304.800 m) Lake of the Woods datum; gage readings have been reduced to elevations based on Lake of the Woods datum.

REMARKS.--Runoff conditions of the Warroad River can affect water levels obtained at this station. Water level subject to fluctuation caused by change in direction and velocity of wind and seiches.

COOPERATION.--This station is one of the International gaging stations maintained by the United States under agreement with Canada.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation, 1,062.36 ft (323.807 m) Sept. 12, 1978; maximum daily, 1,061.84 ft (323.649 m) Sept. 12, 1978; minimum elevation recorded, 1,055.94 ft (321.851 m) Sept. 4, 1980; minimum daily recorded, 1,056.52 ft (322.027 m) Apr. 15, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,061.21 ft (323.457 m) Nov. 12; maximum daily, 1,060.99 ft (323.390 m) Dec. 2,4; minimum 1,057.78 ft (322.411 m) May 13; minimum daily, 1058.26 ft (322.558 m) May. 13.

ELEVATION, IN FEET LAKE OF THE WOODS DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1060.08	1060.72	1060.95	1060.54	1059.86	1059.23	1058.82	1058.75	1058.72	1059.54	1059.99	1059.67
2	1059.91	1060.79	1060.99	1060.52	1059.83	1059.21	1058.85	1058.71	1058.76	1059.65	1059.92	1059.73
3	1059.96	1060.88	1060.95	1060.54	1059.79	1059.20	1058.85	1058.63	1058.76	1059.56	1060.01	1059.48
4	1059.88	1060.98	1060.99	1060.48	1059.77	1059.18	1058.85	1058.71	1058.93	1059.65	1059.96	1059.70
5	1060.14	1060.76	1060.96	1060.48	1059.75	1059.17	1058.85	1058.65	1058.77	1059.67	1059.93	1059.59
6	1060.67	1060.67	1060.95	1060.43	1059.72	1059.19	1058.85	1058.88	1058.70	1059.67	1060.00	1059.47
7	1060.20	1060.58	1060.95	1060.40	1059.70	1059.20	1058.85	1058.79	1058.84	1059.76	1059.81	1059.69
8	1060.20	1060.74	1060.94	1060.42	1059.68	1059.16	1058.85	1058.65	1058.84	1059.89	1059.99	1059.83
9	1060.57	1060.78	1060.95	1060.40	1059.66	1059.16	1058.85	1058.58	1058.81	1059.95	1059.90	1059.90
10	1060.48	1060.77	1060.88	1060.39	1059.63	1059.16	1058.83	1058.62	1058.69	1059.85	1060.00	1059.24
11	1060.42	1060.71	1060.88	1060.36	1059.59	1059.15	1058.84	1058.72	1058.68	1059.38	1059.92	1059.64
12	1060.37	1060.92	1060.90	1060.35	1059.59	1059.14	1058.84	1059.03	1058.71	1059.81	1059.76	1059.75
13	1060.23	1060.73	1060.88	1060.35	1059.55	1059.10	1058.84	1058.26	1058.68	1059.80	1059.75	1059.69
14	1060.32	1060.55	1060.87	1060.30	1059.51	1059.10	1058.82	1058.69	1058.88	1059.99	1059.83	1059.74
15	1060.43	1060.60	1060.85	1060.29	1059.50	1059.10	1058.80	1058.81	1058.88	1059.95	1059.72	1060.02
16	1060.46	1060.73	1060.86	1060.25	1059.46	1059.07	1058.79	1058.72	1059.01	1059.86	1059.90	1059.83
17	1060.46	1060.85	1060.85	1060.24	1059.45	1059.06	1058.78	1058.56	1058.94	1059.95	1059.75	1059.62
18	1060.67	1060.82	1060.80	1060.25	1059.47	1059.04	1058.76	1058.64	1059.00	1059.98	1059.71	1058.85
19	1060.68	1060.85	1060.79	1060.23	1059.44	1059.02	1058.74	1058.78	1058.98	1060.02	1059.54	1059.45
20	1060.62	1060.61	1060.79	1060.19	1059.39	1059.00	1058.73	1058.77	1059.01	1060.02	1059.80	1059.46
21	1060.46	1060.58	1060.80	1060.16	1059.39	1058.98	1058.71	1058.55	1059.09	1060.08	1059.79	1059.55
22	1060.57	1060.84	1060.80	1060.12	1059.33	1058.95	1058.72	1058.74	1059.06	1059.90	1059.73	1059.68
23	1060.57	1060.84	1060.77	1060.09	1059.32	1058.94	1058.71	1058.75	1059.27	1059.98	1059.73	1059.48
24	1060.60	1060.86	1060.75	1060.03	1059.30	1058.93	1058.70	1058.88	1059.38	1060.00	1059.75	1059.53
25	1060.72	1060.87	1060.73	1060.02	1059.30	1058.90	1058.72	1058.77	1059.26	1059.97	1059.66	1059.68
26	1060.70	1060.88	1060.73	1060.00	1059.28	1058.88	1058.64	1058.75	1059.49	1059.86	1059.67	1059.68
27	1060.70	1060.91	1060.68	1060.01	1059.27	1058.85	1058.55	1058.81	1059.62	1059.89	1059.70	1059.69
28	1060.73	1060.91	1060.64	1059.97	1059.25	1058.84	1058.62	1058.81	1059.50	1059.93	1059.70	1059.59
29	1060.47	1060.91	1060.62	1059.91	---	1058.84	1058.62	1059.02	1059.51	1059.97	1059.81	1059.86
30	1060.40	1060.94	1060.61	1059.89	---	1058.82	1058.72	1059.00	1059.39	1059.95	1059.80	1059.90
31	1060.58	---	1060.59	1059.88	---	1058.84	---	1058.81	---	1059.98	1059.72	---
MEAN	1060.43	1060.79	1060.83	1060.24	1059.53	1059.05	1058.77	1058.74	1059.01	1059.85	1059.81	1059.64
MAX	1060.73	1060.98	1060.99	1060.54	1059.86	1059.23	1058.85	1059.03	1059.62	1060.08	1060.01	1060.02
MIN	1059.88	1060.55	1060.59	1059.88	1059.25	1058.82	1058.55	1058.26	1058.68	1059.38	1059.54	1058.85

WTR YR 1983 MEAN 1059.73 MAX 1060.99 MIN 1058.26

BEST COPY AVAILABLE

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

As the number of streams on which streamflow information is likely to be desired far exceeds the number of stream-gaging stations feasible to operate at one time, the Geological Survey collects limited streamflow data at sites other than stream-gaging stations. When limited streamflow data are collected on a systematic basis over a period of years for use in hydrologic analyses, the site at which the data are collected is called a partial-record station. Data collected at these partial-record stations are usable in low-flow or flood-flow analyses, depending on the type of data collected. In addition, discharge measurements are made at other sites not included in the partial-record program. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Records collected at partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations and the second is a table of annual maximum stage and discharge at high-flow stations. Discharge measurements made at miscellaneous sites for both low flow and high flow are given in a third table.

Low-flow partial-record stations

Measurements of streamflow in the area covered by this report made at low-flow partial-record stations are given in the following table. These measurements were made during periods of base flow when streamflow is primarily from ground-water storage. These measurements, when correlated with the simultaneous discharge of a nearby stream when continuous records are available, will give a picture of the low-flow potentiality of a stream. The column headed "Period of record" shows the water years in which measurements were made at the same, or practically the same site.

Discharge measurements made at low-flow partial-record stations during water year 1983

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Streams tributary to Lake Superior				
04010850	Brule River near Grand Marais, MN	Lat 47°55'57", long 90°18'37", in SE¼SW¼ sec.15, T.63 N., R.1 E., Cook County, Hydrologic Unit 04010101, at bridge on National Forest Development Road 309, 0.5 mile upstream from South Brule River, and 13 miles north of Grand Marais.	88.8	1970-71, 1974-76, 1980, 1983	9-27-83	36.1
04010900	South Brule River near Grand Marais, MN	Lat 47°55'34", long 90°18'22", inSW¼NE¼ sec.22, T.63 N., R.1 E., Cook County, Hydrologic Unit 04010101, at bridge on County Highway 12 (Gunflint Trail), 0.1 mile upstream from mouth, and 12 miles north of Grand Marais.	76.5	1970-71, 1974-76, 1980, 1983	9-27-83	22.7
04011000	Brule River near Hovland, MN	Lat 47°49'06", long 90°03'04", in SE¼SW¼ sec.27, T.62 N., R.3 E., Cook County, Hydrologic Unit 04010101, at bridge on U.S. Highway 61, 0.3 mile upstream from mouth, and 4.5 miles southwest of Hovland.	264	1912, 1970-71, 1974-77, 1980, 1983	9-27-83	86.8
04011500	Devil Track River near Grand Marais, MN	Lat 47°46'12", long 90°15'39", in SW¼NE¼ sec.13, T.61 N., R.1 E., Cook County, Hydrologic Unit 04010101, at bridge on U.S. Highway 61, 0.1 mile upstream from mouth, and 3.9 miles northeast of Grand Marais.	74.8	1911-12, 1970-71, 1974-77, 1980, 1983	9-27-83	8.40
04012600	Temperance River near Tofte, MN	Lat 47°48'04", long 90°50'43", in NE¼NW¼ sec.4, T.61 N., R.4 W., Cook County, Hydrologic Unit 04010101, at bridge on National Forest Development Road 165, 1.8 miles downstream from Sawbill Creek, and 16 miles north of Tofte.	87.6	1970-71, 1974-76, 1980, 1983	9-27-83	23.4
04012700	Temperance River near Schroeder, MN	Lat 47°33'17", long 90°52'28", in SE¼NE¼ sec.31, T.59 N., R.4 W., Cook County, Hydrologic Unit 04010101, at bridge on U.S. Highway 61, 0.1 mile upstream from mouth, and 1.2 miles northeast of Schroeder.	185	1911-12, 1970-71, 1974-76, 1980, 1983	9-27-83	49.8
04015387	Amity Creek at Duluth, MN	Lat 46°50'39", long 92°00'36", in SE¼NE¼ sec.5, T.50 N., R.13 W., St. Louis County, Hydrologic Unit 04010101, at bridge on Parkway Road, 0.4 mile upstream from Lester River, and 6 miles northeast of aerial bridge in Duluth.	16.2	1970-71, 1974-76, 1980, 1983	9-28-83	1.80

BEST COPY AVAILABLE

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at low-flow partial-record stations during water year 1983

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Streams tributary to Lake Superior--Continued				
04015390	Lester River at Duluth, MN	Lat 46°50'12", long 92°00'21", in NE¼NE¼ sec.8, T.50 N., R.13 W., St. Louis County, Hydrologic Unit 04010102, at bridge on U.S. Highway 61, at mouth, and 5.7 miles northeast of aerial bridge in Duluth.	53.1	1970-71, 1974-76, 1980, 1983	9-28-83	11.2
a04020700	Bug Creek at Shaw, MN	Lat 47°06'40", long 92°21'03", in SW¼SE¼ sec.34, T.54 N., R.16 W., St. Louis County, Hydrologic Unit 04010201, at left bank on downstream side of culverts on County Road 15 at Shaw, and 7.5 miles upstream from mouth.	24	1979-83	9-28-83	8.79
		Streams tributary to the Red River of the North				
*05085500	Snake River at Warren, MN	Lat 48°11'50", long 96°46'45", in SE¼ sec.36 T.155 N., R.48 W., Marshall County, Hydrologic Unit 09020309, at bridge on Minnesota Street in Warren (05085500).	175	1945#, 1946-49, 1953-56#, 1970-72, 1974-76, 1978, 1983	9-28-83	2.04
*05086000	Snake River at Alvarado, MN	Lat 48°11'50", long 97°00'20", in SW¼SE¼ sec.31, T.155 N., R.49 W., Marshall County, Hydrologic Unit 09020309, at bridge on State Highway 1, on west edge of Alvarado, and 22 miles upstream from mouth (05086000).	309	1945#, 1953-56#, 1978-80, 1983	9-28-83	2.00
*05095000	Two Rivers at Hallock, MN	Lat 48°46'30", long 96°55'52", in SE¼SE¼ sec.12, T.161 N., R.49 W., Kittson County, Hydrologic Unit 09020312, at bridge on State Highway 175 at east edge of Hallock, and 0.25 mile downstream from South Branch Two Rivers (05095000).	625	1911-14#, 1929-30#, 1941-43#, 1967-71, 1974, 1976, 1978, 1983	9-27-84	.80
*05102900	Roseau River near Skime, MN	Lat 48°38'30", long 95°35'47", in SE¼SW¼ sec.30, T.160 N., R.38 W., Roseau County, Hydrologic Unit 09020314, at bridge on County Highway 4, 6.5 miles north of Skime, and about 11 miles southeast of Malung.	134	1971-73, 1976-77, 1979-80, 1983	9-26-83	21.2
05105200	Hay Creek near Salol, MN	Lat 48°51'39", long 95°35'39", in SE¼SE¼ sec.7, T.162 N., R.38 W., Roseau County, Hydrologic Unit 09020314, at culvert on State Highway 11, 1.3 miles southwest of Salol, and about 8.5 miles northeast of Malung.	66.1	1971-73, 1976-77, 1979-80, 1983	9-26-83	0.65

* Also published under low-flow investigations of streams tributary to the Red River of the North.
# Operated as a continuous-record gaging station.
a Also published under annual maximum discharge at high-flow partial-record stations.

BEST COPY AVAILABLE

BEST COPY AVAILABLE

136

BLANK PAGE

BLANK PAGE

BLANK PAGE

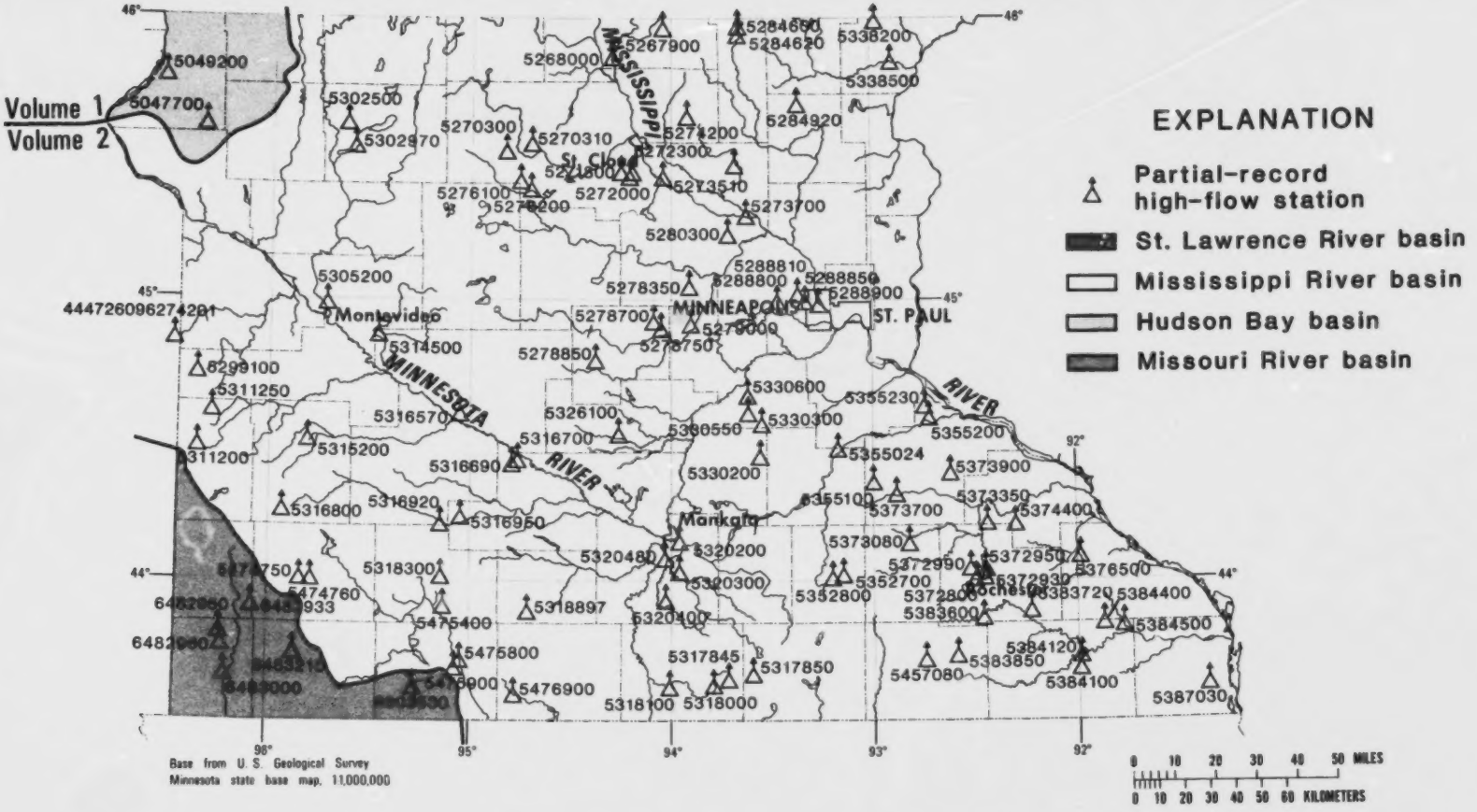


Figure 9.--Location of high-flow partial-record stations

BEST COPY AVAILABLE

137

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

High-flow partial-record stations

The following table contains annual maximum discharge for high-flow stations. A high-flow partial-record station is equipped with a crest-stage gage, a device which will register the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharge measurements made by indirect measurements of peak flow or by current meter. The date of the maximum discharge is not always certain but is usually determined by comparison with nearby continuous-record stations, weather records, or local inquiry. Only the maximum discharge for each water year is given. Information on some lower floods may have been obtained, and discharge measurements may have been made for purposes of establishing the stage-discharge relation, but these are not published herein. The years given in the period of record represent water years for which the annual maximum has been determined.

Annual maximum discharge at high-flow partial-record stations during water year 1983

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Streams tributary to Lake Superior					
04012500	Poplar River at Lutsen, MN	Lat 47°38'23", long 90°42'31", in SW¼ NE¼ sec.33, T.60 N., R.3 W., Cook County, Hydrologic Unit 04010101, 350 ft upstream from bridge on U.S. Highway 61 at Lutsen, and 0.3 mile upstream from mouth.	112	1912-17#, 1928-47#, 1952-61#, 1972-83	10- 7-82	4.76	692
04013200	Caribou River near Little Marais, MN	Lat 47°27'51", long 91°01'50", in NW¼ SE¼ sec.36, T.58 N., R.6 W., Lake County, Hydrologic Unit 04010101, at culvert on U.S. Highway 61, 0.2 mile upstream from mouth, and 5.2 miles northeast of Little Marais.	22.7	1961-83	11-20-82	14.24	730
04015200	Encampment River tributary at Silver Creek, MN	Lat 47°07'01", long 91°36'04", in NE¼ SE¼ sec.33. T.54 N., R.10 W., Lake County, Hydrologic Unit 04010102, at culvert on County Highway 3, 0.3 mile north of Silver Creek, and 1.4 miles upstream from mouth.	.96	1960-83	7- 3-83	7.22	†
04015250	Silver Creek tributary near Two Harbors, MN	Lat 47°04'40", long 91°36'49", in SW¼ NE¼ sec.16, T.53 N., R.10 W., Lake County, Hydrologic Unit 04010102, at culvert on County Highway 3, 1.0 mile upstream from mouth, and 4.5 miles northeast of Two Harbors.	3.72	1965-83	10- 6-82	4.44	215
04015300	Little Stewart River near Two Harbors, MN	Lat 47°03'52", long 91°40'03", in SE¼ NE¼ sec.24, T.53 N., R.11 W., Lake County, Hydrologic Unit 04010102, at culvert on county highway, 2.0 miles upstream from mouth, and 2.7 miles north of Two Harbors.	5.54	1960-83	10- 6-82	9.54	†
04015370	Talmadge River at Duluth, MN	Lat 46°53'20", long 91°55'21", in SE¼ NE¼ sec.24, T.51 N., R.13 W., St. Louis County, Hydrologic Unit 04010102, at culvert on U.S. Highway 61, 0.6 mile upstream from mouth, and 0.5 mile northeast of Duluth city limits.	5.79	1964-83	10-10-82	16.39	465
04015400	Miller Creek at Duluth, MN	Lat 46°49'01", long 92°10'42", in SE¼ NE¼ sec.13, T.50 N., R.15 W., St. Louis County, Hydrologic Unit 04010201, at culvert on U.S. Highway 53, 0.2 mile northwest of Duluth city limits.	4.92	1960-83	11-20-82	b18.82	370

"See footnotes at end of the table."

BEST COPY AVAILABLE

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1983--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Streams tributary to Lake Superior--Continued					
04020480	North Branch Whiteface River near Fairbanks, MN	Lat 47°22'20", long 91°56'28", at common corner of secs.35, 36, 1, and 2, along line between T.57 N., and T.56 N., R.13 W., St. Louis County, Hydrologic Unit 04010201, on right downstream wingwall of double box culvert on County Highway 16, 2 miles upstream from the mouth of Jenkins Creek, and 0.7 mile west of Fairbanks.	17.1	1979-83	7- 5-83	a12.69	125
04020700	Bug Creek at Shaw, MN	Lat 47°06'40", long 92°21'03", in SW¼ SE¼ sec.34, T.54 N., R.16 W., St. Louis County, Hydrologic Unit 04010201, at left bank on downstream side of culverts on County Road 15 at Shaw, and 7.5 miles upstream from mouth.	24.0	1979-83	7- 5-83	a13.61	233
04021205	Floodwood River above Floodwood, MN	Lat 46°17'15", long 92°53'40", in NE¼NW¼ sec.32, T.52 N., R.20 W., St. Louis County, Hyrologic Unit 04010201, at bridge on County Highway 835, 500 ft west of State Highway 73, and 2 miles north of Floodwood.	198	1972-83	10-12-82	15.84	1,140
04024095	Nemadji River near Holyoke, MN	Lat 46°31'04", long 92°23'22", in NE¼NE¼ sec.32, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at bridge on State Highway 23, 3.5 miles north of Holyoke.	118	1972-83	4-15-82 11-20-82	11.26 13.68	1,470 2,480
04024100	Rock Creek near Blackhoof, MN	Lat 45°32'10", long 92°22'12", in SW¼ SE¼ sec.21, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at culvert on State Highway 23, 4.0 miles upstream from mouth, and 4.4 miles east of Blackhoof.	4.94	1961-65, 1967-83	11-20-82	22.28	940
04024110	Rock Creek tributary near Blackhoof, MN	Lat 46°32'14", long 92°22'05", in NE¼SE¼ sec.21, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at culvert on State Highway 23, 0.1 mile upstream from mouth, and 4.5 miles east of Blackhoof.	.20	1961-83	9- 3-80 6-13-81 3-31-82 11-20-82	11.41 12.06 b12.84 16.74	c26 c31 24 c62
04024200	South Fork Nemadji River near Holyoke, MN	Lat 46°29'38", long 92°24'36", in SE¼SE¼ sec.6, T.46 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at culvert on State Highway 23, 1.7 miles downstream from Clear Creek, and 2.0 miles northwest of Holyoke.	19.4	1961-83	11-20-82	d18.52	1,950
		Red River of the North basin					
05047700	West Branch Mustinka River tributary near Graceville, MN	Lat 45°36'53", long 96°19'47", in NE¼NW¼ sec.28, T.125 N., R.45 W., Traverse County, Hydrologic Unit 09020102, at culvert on county highway, 6.0 miles northeast of Graceville.	3.37	1964-83	7-18-83	a7.09	19

"See footnotes at end of the table."

BEST COPY AVAILABLE

Annual maximum discharge at high-flow partial-record stations during water year 1983--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Red River of the North basin--Continued					
05049200	Eighteenmile Creek near Wheaton, MN	Lat 45°47'18", long 96°31'52", on west quarter of line between secs.24 and 25, T.127 N., R.47 W., Traverse County, Hydologic Unit 09020102, at culvert on County Highway 67, 1.4 miles upstream from mouth, and 2.0 miles southwest of Wheaton.	68.5	1965-68, 1970-83	7-18-83	e5.07	15
05050700	Rabbit River near Nashua, MN	Lat 46°04'30", long 96°18'24", in SE¼NE¼ sec.15, T.130 N., R.45 W., Wilkin County, Hydrologic Unit 09020101, at right downstream piling of bridge on County Road 19, 2.6 miles north of Nashua, 4.8 miles upstream from mouth of South Fork Rabbit River.	56.1	1979-83	4-10-83	b11.98	430
05060800	Buffalo River near Callaway, MN	Lat 47°01'17", long 95°54'43", in SW¼ SE¼ sec.17, T.141 N., R.41 W., Becker County, Hydrologic Unit 09020106, at culvert on U.S. Highway 59, 2.7 miles north of Callaway.	94.5	1960-83	7- 4-83	16.85	†
05061200	Whiskey Creek at Barnesville, MN	Lat 46°39'35", long 96°23'54", in SE¼ SW¼ sec.20, T.137 N., R.45 W., Clay County, Hydrologic Unit 09020106, at culvert on State Highway 34, 0.7 mile upstream from Blue Eagle Lake, and 1.0 mile northeast of Barnesville.	25.3	1961-64, 1965-66, 1967-83	7-30-81 5-17-82 7- 2-83	a4.09 a3.63 a5.16	f67 f38 175
05061400	Spring Creek above Downer, MN	Lat 46°44'37", long 96°25'12", in NW¼ NW¼ sec.30, T.138 N., R.45 W., Clay County, Hydrologic Unit 09020106, at culvert on county road, 3.1 miles east of Downer.	5.81	1961-83	3-23-76 7- 5-77 3-31-78 6-30-79 3-28-80 7-30-81 5-17-82 7- 2-83	b6.75 d7.02 b9.18 d7.39 b7.42 d6.26 d7.14 9.96	f5.8 f31 f74 f46 f22 f11 f10 184
05062280	Mosquito Creek near Bagley, MN	Lat 47°27'02", long 95°22'55", in SW¼NW¼ sec.21, T.146 N., R.37 W., Clearwater County, Hydrologic Unit 09020108, at culvert on State Highway 92, 5.0 miles south of Bagley.	3.98	1961-83	10-11-82	8.20	23
05062470	Marsh Creek tributary near Mahnomen, MN	Lat 47°19'31", long 96°04'41", in SE¼SW¼ sec.36, T.145 N., R.43 W., Norman County, Hydrologic Unit 09020108, at culvert on State Highway 31, 0.1 mile upstream from mouth, and 5.2 miles west of Mahnomen.	11.9	1961-83	8-25-83	a10.79	26
05062700	Wild Rice River tributary near Twin Valley, MN	Lat 47°17'47", long 96°19'42", in SW¼SE¼ sec.12, T.144 N., R.45 W., Norman County, Hydrologic Unit 09020107, at culvert on State Highway 31, 1.2 miles upstream from mouth, and 4.1 miles northwest of Twin Valley.	4.72	1961-83	10-11-82	11.44	38
05062800	Coon Creek near Twin Valley, MN	Lat 47°15'51", long 96°20'34", in NE¼NE¼ sec.26, T.144 N., R.45 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 28, 1.3 miles upstream from mouth, and 4.0 miles west of Twin Valley.	50.8	1962-83	10-11-82	9.49	136

"See footnotes at end of the table."

BEST COPY AVAILABLE

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1983--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Red River of the North basin--Continued					
05063200	Spring Creek tributary near Ogema, MN	Lat 47°07'22", long 95°57'35", in SE¼SE¼ sec.11, T.142 N., R.42 W., Becker County, Hydrologic Unit 09020108, at culvert on county highway, 2.0 miles northwest of Ogema.	4.99	1963-83	7- 3-83	a6.89	44
05063500	South Branch Wild Rice River near Borup, MN	Lat 47°11'40", long 96°34'40", in NW¼NW¼w sec.24, T.143 N., R.47 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 193, 3.5 miles upstream from Wild Rice River, and 4.0 miles northwest of Borup.	254	1944-49#, 1972-83	5-23-81 3-31-82 7- 4-83	13.11 b14.34 10.33	1,360 860 690
05073600	South Branch Battle River at Northome, MN	Lat 47°52'17", long 94°17'45", in NW¼NE¼ sec.25, T.151 N., R.29 W., Koochiching County, Hydrologic Unit 09020302, at culvert on U.S. Highway 71, 0.7 mile west of Northome, and 3.1 miles upstream from Battle Lake.	2.80	1960-83	6-15-83	a14.79	46
05073750	Spring Creek near Blackduck, MN	Lat 47°46'23", long 94°31'22", in NW¼NW¼ sec.32, T.150 N., R.30 W., Beltrami County, Hydrologic Unit 09020302, at culvert on County Highway 304, 3.1 miles north of Blackduck, and 3.2 miles upstream from mouth.	7.96	1960-83	4- 8-80 6-28-81 4-24-82 6-15-83	12.83 13.09 15.22 14.24	34 43 140 110
05073800	Perry Creek tributary near Shooks, MN	Lat 47°52'00", long 94°32'52", in NW¼SW¼ sec.30, T.151 N., R.30 W., Beltrami County, Hydrologic Unit 09020302, at culvert on State Highway 72, 5.2 miles west of Shooks.	1.14	1960-83	8-21-83	a6.94	27
05075700	Mud River near Grygla, MN	Lat 48°19'31", long 95°44'35", at common corner of secs.13, 14, 23, and 24, T.156 N., R.40 W., Hydrologic Unit 09020304, Marshall County, at bridge on State Highway 89, 6 miles west of Grygla.	170	1979-83	6-23-83	16.34	670
05077700	Ruffy Brook near Gonvick, MN	Lat 47°44'50", long 95°24'45", in SE¼SE¼ sec.5, T.149 N., R.37 W., Clearwater County, Hydrologic Unit 09020305, on downstream side of bridge on County Highway 17, 4.0 miles upstream from mouth,and 4.8 miles east of Gonvick.	45.2	1960-78#, 1979-83	3- 7-83	b4.81	175
05078180	Silver Creek near Clearbrook, MN	Lat 47°38'43", long 95°26'33", in NW¼ sec.13, T.148 N., R.38 W., Clearwater County, Hydrologic unit 09020305, at culvert on county highway, 3.4 miles south of Clearbrook.	4.96	1960-83	10-11-82	8.15	†
05078400	Clearwater River tributary near Plummer, MN	Lat 47°52'34", long 96°08'35", in SE¼SE¼ sec.22, T.151 N., R.43 W., Red Lake County, Hydrologic Unit 09020305, at culvert on county highway, 1.2 miles upstream from mouth, and 5.3 miles southwest of Plummer.	6.51	1961-83	5-13-83	11.56	†

"See footnotes at end of the table."

BEST COPY AVAILABLE

Annual maximum discharge at high-flow partial-record stations during water year 1983--Continued

Station No.	Station name	Location	Drainage area (mi^2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft^3/s)
		Red River of the North basin--Continued					
05086900	Middle River near Newfolden, MN	Lat 48°22'04", long 96°16'47", in NE¼NE¼ sec.3, T.156 N., R.44 W., Marshall County, Hydrologic Unit 09020309, at bridge on township road, 2.0 miles northeast of Newfolden.	91.1	1979-83	3- 7-83	b15.87	225
05094000	South Branch Two Rivers at Lake Bronson, MN	Lat 48°43'50", long 96°39'50", in SW¼SW¼ sec.30, T.161 N., R.46 W., Kittson, County, Hydrologic Unit 09020312, 70 ft upstream from culvert on U.S. Highway 59 at town of Lake Bronson, and 3.4 miles downstream from dam at outlet of Bronson Lake.	444	1929-36#, 1937#, 1941-47#, 1954-81#, 1982-83	3- 8-83	b9.33	1,530
		Lake of the Woods basin					
05129650	Little Fork River at Cook, MN	Lat 47°51'15", long 92°41'55", in SE¼NE¼ sec.13, T.62 N., R.19 W., St. Louis County, Hydrologic Unit 09030005, at bridge on U.S. Highway 53, 0.6 mile west of Cook.	61.5	1968-83	10- 8-82	15.06	380
05130300	Boriin Creek near Chisholm, MN	Lat 47°36'14", long 92°51'58", in SE¼SE¼ sec.9, T.59 N., R.20 W., St. Louis County, Hydrologic Unit 09030005, at culvert on State Highway 73, 1.3 miles upstream from mouth, and 7.8 miles north of Chisholm.	13.7	1959-83	11-21-82	b12.02	126
05131750	Big Fork River near Bigfork, MN	Lat 47°44'56", long 93°46'31", in SW¼NE¼ sec.27, T.61 N., R.27 W., Itasca County, Hydrologic Unit 09030006, at bridge on State Highway 6, 5.5 miles west of Bigfork.	602	1973-83	6-16-83	13.21	1,500
05131878	Bowerman Brook near Craigville, MN	Lat 47°55'29", long 93°45'34", in NE¼NW¼ sec.26, T.63 N., R.27 W., Koochiching County, Hydrologic Unit 09030006, on left downstream wingwall of bridge on State Highway 6, 2.4 miles upstream from mouth, and 7.0 miles west of Craigville.	25.0	1979-83	6-16-83	13.54	330
05140000	Bulldog Run near Warroad, MN	Lat 48°51'30", long 95°20'18", in SW¼SE¼ sec.7, T.162 N., R.36 W., Roseau County, Hydrologic Unit 09030009, 10 ft downstream from culvert on county highway, 0.8 mile upstream from mouth, and 2.5 miles south of Warroad.	11.1	1946-51#, 1966-77#, 1978-83	3- 9-83	b6.18	76
05140500	East Branch Warroad River near Warroad, MN	Lat 48°51'29", long 95°18'40", in NE¼ NE¼ sec.17, T.162 N., R.36 W., Roseau County, Hydrolgoic Unit 09030009, at upstream side of highway bridge, 3.3 miles upstream from mouth, and 2.5 miles south of Warroad.	45.8	1946-54#, 1966-77#, 1978-83	6-22-83	d7.64	184

\# Operated as a continuous-record gaging station.
† Discharge not determined.
a Affected by shifting control.
b Backwater from ice.
c Adjusted for inflow to storage.
d Backwater from aquatic growth and debris.
e Affected by beaver dam.
f Revised.

BEST COPY AVAILABLE

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements at miscellaneous sites

Measurements of streamflow at points other than gaging stations are given in the following table. The measurements of base flow are designated by an asterisk (*); measurements of peak flow by a dagger (†).

Discharge measurements made at miscellaneous sites during water year 1983

Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Measurements	
					Date	Discharge (ft^3/s)
		Red River of the North basin				
Snake River	Red River of the North	Lat 48°11'50", long 96°46'45", in SE¼ sec.36, T.155 N., R.48 W., Marshall County, Hydrologic Unit 09020309, at bridge on Minnesota Street in Warren MN (05085500).	175	1945#, 1946-49, 1953-56#, 1970-72, 1974-76, 1978-79, 1982	3-17-83	204
Roseau River	Red River of the North	Lat 48°53'28", long 95°43'50", in SW¼SE¼ sec.31, T.163 N., R.39 W., Roseau County, Hydrologic Unit 09020314, at bridge on County Highway 28, 900 feet downstream from Hay Creek, and 3.2 miles northeast of Roseau, MN (05105300).	-	1973-82	10-25-82 1-03-83 2-28-83 4-11-83 6-14-83 8- 2-83	355 *12 *9.0 423 165 *23

Operated as a continuous-record gaging station.

BEST COPY AVAILABLE

LOW-FLOW INVESTIGATIONS

Low-flow investigations of streams tributary to the Red River of the North

Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
		Red Lake River basin				
Lost River	Clearwater River	Lat 47°45'54", long 95°29'42", in NE¼SE¼ sec.34, T.150 N., R.38 W., Clearwater County, Hydrologic Unit 09020305, at bridge on county road, 2 miles northeast of Gonvick, MN.	-	1967 1980	9-29-83	31.2
		Snake River basin				
Snake River	Red River of the North	Lat 48°13'41", long 96°33'56", in SE¼SE¼ sec.21, T.155 N., R.46 W., Marshall County, Hydrologic Unit 09020309, at bridge on county road, 2 miles east of Radium, MN.	-	1980	9-26-83	0
bSouth Branch Snake River	Snake River	Lat 48°12'36", long 96°33'56", in NE¼NE¼ sec.33, T.155 N., R.46 W., Marshall County, Hydrologic Unit 09020309, at bridge on county road, 2.4 miles southeast of Radium, MN.	-	1980	9-28-83	0
Snake River tributary	Snake River	Lat 48°11'51", long 96°39'48", in SW¼SE¼ sec.35, T.155 N., R.47 W., Marshall County, Hydrologic Unit 09020309, 5 miles east of Warren, MN.	-	-	9-28-83	0.82
*Snake River	Red River of the North	Lat 48°11'50", long 96°46'45", in SE¼ sec.36, T.155 N., R.48 W., Marshall County, Hydrologic Unit 09020309, at bridge on Minnesota Street in Warren, MN (05085500).	175	1945#, 1946-49, 1953-56#, 1970-72, 1974-76, 1978-82	9-28-83	2.04
*Snake River	Red River of the North	Lat 48°11'50", long 97°00'20", in SW¼SE¼ sec.31, T.155 N., R.49 W., Marshall County, Hydrologic Unit 09020309, at bridge on State Highway 1, on west edge of Alvarado, MN, and 22 miles upstream from mouth (05086000).	309	1945#, 1953-56#, 1978-80	9-28-83	2.00
County ditch 21	Snake River	Lat 48°13'27", long 97°01'15", in NE¼NE¼ sec.25, T.155 N., R.50 W., Marshall County, Hydrologic Unit 09020309, at bridge on county road, 2.4 miles northwest of Alvarado, MN.	-	1980	9-28-83	.03
County ditch 21	Snake River	Lat 48°16'56", long 97°02'36", in NE¼NE¼ sec.2, T.155 N., R.50 W., Marshall County, Hydrologic Unit 09020309, at culvert on township road, 2.9 miles southeast of Big Woods, MN.	-	-	9-28-83	0.17
Snake River tributary 5	Snake River	Lat 48°18'40", long 97°02'37", in NE¼NE¼ sec.26, T.156 N., R.50 W., Marshall County, Hydrologic Unit 09020309, at bridge on county road 19, 3 miles east of Big Woods, MN.	-	1980	9-28-83	.02
Snake River	Red River of the North	Lat 48°21'27", long 97°03'56", in SE¼SE¼ sec.3, T.156 N., R.50 W., Marshall County, Hydrologic Unit 09020309, at bridge on County Road 17, about 3.4 miles northeast of Big Woods, MN, 1 mile upstream from Middle River (05086500).	-	1945-46, 1949-51, 1980	9-28-83	9.2
cMiddle River	Snake River	Lat 48°22'01", long 96°33'53", in NW¼NW¼, sec.3, T.156 N., R.46 W., Marshall County, 0.5 mile north of entrance to Old Mill State Park, and 9.5 miles southeast of Strandquist, MN (05087000).	-	1953-57#, 1971-72	9-27-83	0.16
Middle River	Snake River	Gaging station at Argyle, MN (05087500).	265	1945, 1950-80#	9-28-83	0.08
Middle River	Snake River	Lat 48°22'12", long 97°03'48", in SE¼SE¼ sec.35, T.157 N., R.50 W., Marshall County, Hydrologic Unit 09020309, at bridge on County Highway 17, 4.5 miles northeast of Big Woods, MN.	-	1980	9-28-83	0.12

"See footnotes at end of table."

BEST COPY AVAILABLE

LOW-FLOW INVESTIGATIONS

Low-flow investigations of streams tributary to the Red River of the North--Continued

Stream	Tributary to	Location	Drainage area (mi^2)	Measured previously (water years)	Date	Discharge (ft^3/s)
		Snake River basin--Continued				
Tamarac River	Red River of the North	Lat 48°25'30", long 96°37'40", in NE¼NE¼ sec.18, T.157 N., R.46 W., Marshall County, Hydrologic Unit 09020311, at County Highway 1, 1.2 miles south of Florian, and 9 miles southwest of Strandquist, MN (05090500).	-	1953-56#	9-27-83	0.67
Tamarac River	Red River of the North	Lat 48°26'24", long 96°52'01", in NE¼NE¼ sec.8, T.157 N., R.48 W., Marshall County, Hydrologic Unit 09020311, at bridge on U.S. Highway 75, 0.5 mile south of Stephen, MN (05091000).	254	1945, 1946-51, 1953, 1980	9-27-83	0.05
Tamarac River	Red River of the North	Lat 48°29'35", long 97°06'25", in NE¼SE¼ sec.21, T.158 N., R.50 W., Marshall County, Hydrologic Unit 09020311, at bridge on State Highway 220, about 12 miles northwest of Stephen, MN.	-	1980	9-27-83	0.01
Middle Branch Two Rivers tributary	Middle Branch Two Rivers	Lat 48°47'08", long 96°53'12", in SE¼NE¼ sec.8, T.161 N., R.48 W., Kittson County, Hydrologic Unit 09020312, at bridge on county road, 2.5 miles northeast of Hallock, MN.	-	1980	9-27-83	0
South Branch Two Rivers	Two Rivers	Lat 48°41'56", long 96°10'41", in NE¼SE¼ sec.10, T.160 N., R.43 W., Roseau County, Hydrologic Unit 09020312, at bridge on State Highway 32, at Greenbush, MN.	-	1980	9-27-83	0
South Branch Two Rivers	Two Rivers	Lat 48°45'38", long 96°55'19", in NE¼NW¼ sec.19, T.161 N., R.48 W., Kittson County, Hydrologic Unit 09020312, at bridge on county road, 1.4 miles southeast of Hallock, MN.	-	1980	9-27-83	.063
*Two Rivers	Red River of the North	Lat 48°46'30", long 96°55'52", in SE¼SE¼ sec.12, T.161 N., R.49 W., Kittson County, Hydrologic Unit 09020312, at bridge on State Highway 175 at east edge of Hallock, MN, and 0.25 mile downstream from South Branch Two Rivers (05095000).	625	1911-14#, 1929-30#, 1941-43#, 1967-71, 1974, 1976, 1978-80	9-27-83	.80
Two Rivers	Red River of the North	Lat 48°47'23", long 97°05'35", in SW¼SE¼ sec.2, T.161 N., R.50 W., Kittson County, Hydrologic Unit 09020312, at bridge on County Highway 57, about 5.6 miles southwest of Northcote MN, and about 0.5 mile upstream from North Branch Two Rivers.	-	1980	9-27-83	.05
North Branch Two Rivers	Two Rivers	Lat 48°48'14", long 97°04'36", in NE¼NW¼ sec.1, T.161 N., R.50 W., Kittson County, Hydrologic Unit 09020312, at bridge on County Road 58, 4.5 miles southwest of Northcote, MN.	-	1980	9-27-83	0
*Roseau River	Red River of the North	Lat 48°38'30", long 95°35'47", in SE¼SW¼ sec.30, T.160 N., R.38 W., Roseau County, Hydrologic Unit 09020314 at bridge on County Highway 4, 6.5 miles north of Skime, MN, and about 11 miles southeast of Malung, MN (05102900).	134	1971-73, 1976-77, 1979-80	9-26-83	21.2
*Hay Creek	Roseau River	Lat 48°51'39", long 95°35'39", in SE¼SE¼ sec.7, T.162 N., R.38 W., Roseau County, Hydrologic Unit 09020314, culvert on State Highway 11, 1.3 miles southwest of Salol, MN, and about 8.5 miles northeast of Malung, MN (05105200).	66.1	1971-73, 1976-77, 1979-80	9-26-83	.65

* Also published under measurements made at low-flow partial-record sites.
\# Operated as a continuous-record gaging station.
a Approximately.
b Revised name from State ditch to South Branch Snake River.
c Also a high-flow partial-record station.
d Estimate.

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Water-quality partial-record stations are particular sites where chemical-quality, biological and (or) sediment data are collected systematically over a period of years for use in hydrologic analyses.

464217092375301 BIG LAKE NEAR SAWYER, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
AUG 02...	1300	1.00	13.0	35	39	6.8	24.0	726	7.9

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)
AUG 02...	99	4.1	1.4	1.5	.40	14	3.1	1.8	.2

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
AUG 02...	<.100	<.010	.50	.30	.050	<.010	4.00	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

402226092283301 SANDPOINT LAKE BELOW HARRISON NARROWS NEAR CRANE LAKE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
26...	0910	25.5	49	54	7.1	11.5	2.00	741	9.4	89
AUG										
25...	1045	34.0	56	62	7.9	23.0	2.30	732	7.5	91

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
26...	20	72	<.010	.40	.018	.004	5700	4.30	<.100
AUG									
25...	24	57	.010	.60	.013	.009	9500	3.10	.600

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482242092350001 LUCILLE LAKE NEAR CRANE LAKE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
MAY										
24...	0915	22.0	19	23	6.9	13.5	--	5.1	729	8.4
AUG										
25...	1445	20.5	21	26	6.6	23.5	3	3.1	732	7.7

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)
MAY										
24...	84	2.2	.80	1.1	.40	8.0	<5.0	.40	39	1
AUG										
25...	95	2.2	.82	.90	.40	10	4.0	.40	24	13

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
24...	<.010	.50	.008	.006	29	17	1100	2.50	<.100
AUG									
25...	<.010	.20	.022	.004	7	<1	11000	3.60	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482353092311901 LITTLE TROUT LAKE NEAR CRANE LAKE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
MAY										
24...	1045	--	39	46	7.2	12.0	--	5.5	733	10.4
AUG										
25...	1545	>62.0	41	41	7.4	23.5	1	4.7	732	8.1

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)
MAY										
24...	100	4.8	1.8	--	.50	20	<5.0	.40	22	1
AUG										
25...	99	4.8	1.9	1.0	.50	19	4.0	.40	28	<1

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
24...	<.010	.30	.016	<.001	4	<1	3200	1.30	<.100
AUG									
25...	<.010	.10	.009	.005	<3	<1	7500	1.40	<.10

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482451092471001 ASH RIVER AT ENTRANCE TO SULLIVAN BAY NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
25...	1050	11.0	210	201	7.8	14.0	.90	742	9.3	92
AUG										
23...	1500	11.5	194	191	9.2	24.5	.50	734	11.4	143

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	CARBONATE IT-FLD (MG/L AS CO3) (99445)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY										
25...	122	--	176	<.010	.50	.031	.024	10000	4.80	<.100
AUG										
23...	103	10	137	.093	1.5	.037	.014	140000	66.0	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482545092495401 KABETOGAMA LAKE AT SULLIVAN BAY OUTLET NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
25...	1120	18.7	207	198	7.8	14.5	1.50	742	10.1	102
AUG										
23...	1545	25.5	156	152	9.7	24.5	.70	734	12.0	150

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	CARBONATE IT-FLD (MG/L AS CO3) (99445)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60030)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY										
25...	124	--	151	<.010	.40	.016	<.001	26000	3.40	<.100
AUG										
23...	69	16	110	.022	1.0	.024	.016	310000	24.0	5.10

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482607092511701 KABETOGAMA LAKE AT MOUTH OF MEADWOOD BAY NEAR RAY, MN

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
25...	1020	35.3	77	78	7.5	12.5	2.40	742	11.2	108
AUG										
23...	1645	42.0	67	70	7.6	24.5	1.70	734	7.6	94

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
25...	45	83	<.010	.50	.023	<.001	3100	5.10	<.100
AUG									
23...	35	58	.041	.50	.024	.011	32000	13.0	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482616052372201 NAMAKAN LAKE NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
25...	1225	67.0	45	50	7.2	10.0	2.90	742	10.0	91
AUG										
23...	1100	66.0	41	41	7.3	23.0	2.90	734	7.5	91

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
25...	20	67	.037	.30	.010	<.001	7900	5.40	<.100
AUG									
23...	19	44	--	.20	.007	.001	1500	1.80	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482721093003901 KABETOGAMA LAKE NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
25...	0800	31.9	87	90	7.6	11.0	2.60	741	11.0	103
AUG										
23...	1815	35.0	88	86	9.4	23.5	1.30	734	11.2	138

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
25...	48	82	<.010	.40	.019	.008	7200	5.20	<.100
AUG									
23...	60	67	.048	.70	.049	.024	90000	30.0	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482747092503001 KABETOGAMA LAKE IN LOST BAY NEAR RAY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
25...	0845	35.3	86	90	7.8	13.0	2.40	741	10.0	98
AUG										
23...	1730	35.5	83	83	9.1	24.0	1.70	734	8.5	105

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	CARBONATE IT-FLD (MG/L AS CO3) (99445)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY										
25...	57	--	82	<.010	.40	.011	.003	5800	4.70	<.100
AUG										
23...	37	3.0	65	.023	.60	.013	.011	46000	18.0	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482903092504701 JORGENS LAKE NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
MAY										
24...	1345	20.2	23	27	6.2	14.0	--	3.1	734	9.8
AUG										
25...	1145	20.5	25	31	7.1	23.0	13	2.50	732	7.0

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
MAY									
24...	99	2.7	1.0	1.3	.70	10	<5.0	.60	18
AUG									
25...	85	2.8	1.1	1.0	.50	14	3.0	.60	35

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY										
24...	1	.037	.30	.015	.002	230	38	1100	1.60	<.100
AUG										
25...	3	<.010	.50	.020	.017	110	45	4200	3.90	.700

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482924092525101 LITTLE SHOEPACK LAKE NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UNHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UNHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
MAY										
24...	1450	21.1	23	32	6.7	14.5	--	2.00	734	9.4
AUG										
25...	1230	19.0	26	29	6.7	22.5	23	1.80	732	7.0

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)
MAY										
24...	96	2.7	1.0	1.4	.60	8.0	<5.0	.60	27	1
AUG										
25...	85	2.8	1.2	1.2	.60	10	4.0	.70	41	8

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
24...	<.010	.50	.019	.006	170	9	3900	5.20	<.100
AUG									
25...	<.010	.40	.018	.014	170	1	2000	10.0	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483000092392601 MAMAKAN LAKE ABOVE KETTLE FALLS NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
25...	1320	56.0	46	54	7.2	9.0	3.1	742	6.1	54
AUG										
23...	1215	>115	43	46	7.3	22.5	3.00	734	7.4	89

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
25...	20	64	.062	.20	.019	.011	6500	3.10	<.100
AUG									
23...	20	44	.079	.10	.010	<.001	780	1.20	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483031092453901 BEAST LAKE NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
MAY										
24...	1200	28.5	20	30	6.8	13.5	--	2.90	732	10.8
AUG										
25...	1315	28.5	22	24	7.0	23.0	10	2.20	732	8.4

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)
MAY										
24...	108	2.3	.93	1.3	.70	7.0	<5.0	.60	47	2
AUG										
25...	102	2.2	.95	1.0	.60	9.0	3.0	.60	33	10

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
24...	<.010	.30	.007	<.001	28	1	2400	3.60	<.100
AUG									
25...	<.010	.40	.014	.003	19	6	58000	4.20	2.60

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483129092462001 PEARY LAKE NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)
MAY										
24...	1250	19.8	27	33	6.9	14.0	--	2.70	736	10.0
AUG										
25...	1415	18.5	30	32	6.9	23.0	15	2.10	732	7.6

DATE	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUN, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)
MAY										
24...	100	3.2	1.3	1.4	.70	12	<5.0	.60	22	2
AUG										
25...	93	3.3	1.4	15	.60	16	3.0	.60	35	6

DATE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
24...	<.010	--	--	--	210	13	1900	2.40	<.100
AUG									
25...	.180	.30	.018	.015	110	1	3900	3.40	1.00

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483304093062701 RAINY LAKE AT BLACK BAY NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
23...	1300	5.3	98	96	7.7	13.0	.70	735	8.9	88
AUG										
22...	1615	7.5	91	91	8.3	22.5	.90	734	6.9	83

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
23...	55	95	<.010	.60	.045	.017	19000	6.90	<.100
AUG									
22...	60	70	.163	1.0	.054	.031	100000	26.0	<.100

BEST COPY AVAILABLE

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483622092560701 RAINY LAKE AT BRULE NARROWS NEAR INTERNATIONAL FALLS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	TRANSPARENCY (SECCHI DISK) (M) (00078)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN, DISSOLVED (PERCENT SATURATION) (00301)
MAY										
23...	1420	17.4	41	45	7.0	8.0	3.1	735	11.3	98
AUG										
22...	1430	21.5	46	49	7.6	21.5	2.50	734	8.0	94

DATE	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	PHYTOPLANKTON, TOTAL (CELLS PER ML) (60050)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
23...	16	62	.059	.20	.013	.005	1700	2.00	<.100
AUG									
22...	20	45	.085	.30	.009	<.001	2900	2.20	<.100

BEST COPY AVAILABLE

WATER QUALITY DATA AT STREAMFLOW STATIONS

Field determinations of water temperature and specific conductance are made at many streamflow stations in addition to those that are also regular water-quality stations. These data are usually collected at regular intervals during routine visits to the station. Additional data for each station are published elsewhere in this report.

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
04010500 PIGEON RIVER AT MIDDLE FALLS NEAR GRAND PORTAGE, MN							
OCT. 06, 1982...	213	10.0	89	MAY 25.....	989	12.0	65
FEB. 02, 1983...	321	.0	88	JULY 18.....	588	24.0	---
FEB. 15.....	238	.5	---	JULY 20.....	503	22.0	80
MAR. 29.....	208	.0	---	SEPT. 02.....	180	21.5	---
MAR. 30.....	250	.0	100	SEPT. 14.....	220	12.0	90
04014500 BAPTISM RIVER NEAR BEAVER BAY, MN							
OCT. 05, 1982...	156	10.0	71	MAY 24.....	303	9.5	52
DEC. 09.....	71	.5	68	JULY 19.....	37	20.0	90
FEB. 01, 1983....	40	.0	96	SEPT. 13.....	85	12.0	81
MAR. 29.....	56	.5	92				
04015330 KNIFE RIVER NEAR TWO HARBORS, MN							
OCT. 05, 1982...	76	10.0	135	MAY 27.....	55	9.0	104
DEC. 06.....	94	.5	90	JULY 05.....	470	16.0	86
FEB. 03, 1983...	15	.0	136	JULY 20.....	11	23.0	175
MAR. 31.....	46	.5	125	SEPT. 14.....	17	16.0	151
APR. 06.....	276	.5	80	SEPT. 28.....	14	13.0	155
04015475 PARTRIDGE RIVER ABOVE COLBY LAKE NEAR HOYT LAKES, MN							
OCT. 05, 1982...	218	10.0	80	APR. 11.....	191	2.0	74
NOV. 29.....	123	.5	75	MAY 19.....	132	11.0	80
JAN. 27, 1983...	14	.0	100	JULY 20.....	34	24.5	110
MAR. 22.....	21	.0	150	AUG. 29.....	272	21.0	75
04016500 ST. LOUIS RIVER NEAR AURORA, MN							
OCT. 05, 1982...	450	10.5	115	APR. 11.....	389	4.0	55
NOV. 30.....	445	.5	115	MAY 19.....	364	12.0	55
JAN. 27, 1983...	72	.0	200	JULY 14.....	400	26.0	91
MAR. 22.....	94	.0	105	AUG. 29.....	640	20.0	80
04018750 ST. LOUIS RIVER AT FORBES, MN							
OCT. 04, 1982...	908	11.0	170	MAY 16.....	789	10.0	200
NOV. 01.....	833	6.0	155	JULY 05.....	1610	13.0	140
NOV. 30.....	1180	.5	155	JULY 15.....	876	25.0	195
MAR. 22, 1983...	4.6	.0	---	SEPT. 01.....	1140	22.0	160
APR. 13.....	989	3.5	145				

BEST COPY AVAILABLE

WATER QUALTIY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
04021530 STONEY BROOK AT BROOKSTON, MN							
JUNE 22, 1983...	45	15.0	180	SEPT. 01.....	19	24.0	207
JULY 07.....	122	15.0	137	SEPT. 15.....	17	13.0	217
JULY 26.....	24	22.0	195	SEPT. 29.....	42	13.5	200
AUG. 05.....	82	20.0	150				
04023150 SIMIAN CREEK NEAR BROOKSTON, MN							
JULY 08, 1983...	8.8	18.0	123	SEPT. 01.....	.98	17.5	207
JULY 27.....	.75	19.5	180	SEPT. 15.....	1.6	12.5	200
AUG. 05.....	4.4	20.5	140	SEPT. 29.....	14	13.5	155
04023600 SQUAW CREEK NEAR CLOQUET, MN							
JULY 20, 1983...	3.5	16.5	175	SEPT. 01.....	.37	19.0	144
JULY 27.....	.86	19.0	160	SEPT. 15.....	1.0	12.5	160
AUG. 05.....	6.8	19.0	105	SEPT. 29.....	8.9	13.0	130
04024000 ST. LOUIS RIVER AT SCANLON, MN							
OCT. 04, 1982...	3720	12.5	183	MAY 23.....	2880	13.0	150
DEC. 07.....	2340	1.0	120	JULY 06.....	9340	17.5	116
JAN. 31, 1983...	2200	.0	140	JULY 18.....	1790	25.0	130
MAR. 28.....	1800	.0	160	SEPT. 12.....	1960	19.5	153
04024015 OTTER CREEK NEAR CLOQUET, MN							
JULY 20, 1983...	2.8	15.5	165	SEPT. 01.....	.83	21.0	155
JULY 27.....	.80	17.0	150	SEPT. 15.....	2.5	12.0	118
AUG. 05.....	6.3	19.5	110	SEPT. 29.....	7.6	13.0	83
04024098 DEER CREEK NEAR HOLYOKE, MN							
OCT. 01, 1982...	2.6	11.5	300	APR. 11.....	38	2.5	145
OCT. 20.....	13	---	---	JUNE 08.....	3.8	15.0	260
NOV. 23.....	9.6	.0	190	JULY 22.....	2.3	20.0	275
DEC. 02.....	13	.0	255	AUG. 09.....	1.9	20.5	240
JAN. 19, 1983...	2.4	.0	360	SEPT. 29.....	2.3	13.0	300
MAR. 08.....	37	.0	115				
05046000 OTTER TAIL RIVER BELOW ORWELL DAM NEAR FERGUS FALLS, MN							
NOV. 04, 1982...	146	5.0	470	JUNE 01.....	274	17.0	460
NOV. 23.....	337	---	---	AUG. 16.....	365	26.0	400
JAN. 21, 1983...	266	1.0	500	AUG. 30.....	382	---	---
MAR. 14.....	387	4.0	440				

BEST COPY AVAILABLE

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SOUTH DAKOTA							
NOV. 04, 1982	.0	---	---	MAR. 14	7.0	1.0	860
DEC. 01	52	3.0	1700	APR. 27	2.8	13.0	1200
DEC. 03	50	3.5	1500	JULY 19	.0	---	---
JAN. 21, 1983	.0	---	---	JULY 29	.0	---	---
05061000 BUFFALO RIVER NEAR HAWLEY							
FEB. 23, 1983	27	1.5	690	JULY 05	1070	22.0	360
MAR. 10	128	---	---	JULY 11	494	---	---
MAR. 24	89	5.0	710	AUG. 30	121	---	---
APR. 27	54	13.0	750	SEPT. 27	36	15.5	780
JUNE 29	68	---	---				
05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN							
FEB. 22, 1983	5.1	1.0	950	JULY 05	1470	19.0	340
MAR. 10	107	1.0	590	JULY 07	917	23.0	520
MAR. 24	130	1.5	590	JULY 22	315	---	---
APR. 12	40	---	---	AUG. 26	1.8	27.0	980
JUNE 28	9.3	---	---	SEPT. 27	.59	15.0	950
05062000 BUFFALO RIVER NEAR DILWORTH, MN							
OCT. 13, 1982	259	9.0	750	APR. 12	138	---	---
OCT. 25	93	10.5	1100	APR. 27	100	12.5	820
NOV. 23	62	---	---	MAY 24	101	16.5	900
DEC. 07	71	.0	790	JUNE 28	176	---	---
DEC. 22	34	1.0	890	JULY 07	1570	22.0	360
JAN. 27, 1983	23	.0	940	JULY 11	1480	---	---
FEB. 22	31	1.5	800	JULY 22	1100	---	---
MAR. 10	183	.5	500	AUG. 26	50	24.0	680
MAR. 24.....EST.	260	2.0	600	SEPT. 27	39	15.0	800
05062500 WILD RICE RIVER AT TWIN VALLEY, MN							
OCT. 21, 1982	164	3.0	435	APR. 07	259	.5	420
DEC. 16	44	.0	680	JUNE 15	153	15.0	540
FEB. 09, 1983	44	.0	600	JULY 27	230	23.0	450
MAR. 07	629	.0	---	SEPT. 21	63	10.0	600
05064000 WILD RICE RIVER AT HENDRUM, MN							
DEC. 15, 1982	65	.0	780	JUNE 09	120	18.5	580
FEB. 09, 1983	41	.0	640	SEPT. 21	86	9.5	610
APR. 06	502	1.0	430				

BEST COPY AVAILABLE

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05067500 MARSH RIVER NEAR SHELLY, MN							
OCT. 19, 1982...	12	7.0	600	JULY 06.....	228	18.0	480
DEC. 15.....	3.7	.5	950	JULY 27.....	2.0	23.0	720
APR. 06, 1983...	150	.5	390	SEPT. 21.....	26	9.0	660
JUNE 09.....	1.2	18.0	850				
05069000 SANDHILL RIVER AT CLIMAX, MN							
OCT. 19, 1982...	108	7.5	690	JUNE 09.....	25	15.0	740
DEC. 15.....	26	.0	900	JULY 07.....	191	21.0	575
FEB. 09, 1983...	17	.0	770	JULY 26.....	74	22.0	660
APR. 06.....	414	1.0	377	SEPT. 21.....	69	9.0	655
05074500 RED LAKE RIVER NEAR RED LAKE, MN							
OCT. 29, 1982...	897	8.0	280	APR. 13.....	560	1.0	280
JAN. 07, 1983...	932	1.0	---	JUNE 17.....	678	17.5	285
MAR. 04.....	635	1.0	325	AUG. 12.....	561	24.5	300
05075000 RED LAKE RIVER AT HIGH LANDING NEAR GOODRIDGE, MN							
OCT. 27, 1982...	1280	8.0	290	JUNE 16.....	945	14.0	380
JAN. 06, 1983...	956	.0	335	AUG. 10.....	607	23.0	310
MAR. 02.....	740	2.0	---	AUG. 22.....	1250	20.0	270
APR. 15.....	860	1.5	275				
05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN							
OCT. 28, 1982...	596	9.0	610	JUNE 16.....	441	13.5	560
JAN. 06, 1983...	20	.0	970	AUG. 10.....	163	20.0	510
MAR. 03.....	6.1	.0	1300	AUG. 23.....	237	20.0	395
APR. 14.....	693	1.0	330				
05078000 CLEARWATER RIVER AT PLUMMER, MN							
OCT. 18, 1982...	301	9.0	610	JUNE 07.....	223	15.0	520
DEC. 13.....	57	.0	530	JULY 07.....	424	19.0	560
FEB. 07, 1983...	37	.0	510	JULY 25.....	168	25.0	410
MAR. 03.....	36	.0	480	AUG. 23.....	229	21.0	780
APR. 04.....	623	1.0	442	SEPT. 19.....	366	11.0	710
APR. 13.....	323	4.0	386				

BEST COPY AVAILABLE

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALTIY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05078230 LOST RIVER AT OKLEE, MN							
OCT. 18, 1982	99	10.0	700	JULY 07	124	21.0	700
DEC. 13	14	.5	730	JULY 25	29	25.0	645
FEB. 07, 1983	11	.0	680	AUG. 23	9.9	20.0	650
MAR. 03	28	1.0	500	SEPT. 19	33	11.0	700
APR. 04	222	1.0	462	SEPT. 29	12	11.0	680
JUNE 06	30	17.0	750				
05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN							
OCT. 19, 1982	512	8.0	620	JUNE 07	210	19.0	590
NOV. 10	179	1.0	540	JULY 26	231	22.5	520
DEC. 14	117	.0	540	AUG. 23	306	23.0	---
FEB. 08, 1983	74	.0	460	SEPT. 20	528	10.0	640
APR. 05	1150	1.0	403				
05079000 RED LAKE RIVER AT CROOKSTON, MN							
OCT. 19, 1982	2300	8.0	460	JUNE 08	1150	17.0	520
DEC. 14	628	.5	410	JULY 26	1210	25.0	400
FEB. 08, 1983	1020	.5	360	AUG. 24	2970	22.0	295
APR. 05	3950	.5	358	SEPT. 20	2890	11.0	515
05087500 MIDDLE RIVER AT ARGYLE, MN							
OCT. 28, 1982	59	8.0	700	AUG. 09	.96	22.0	750
JAN. 05, 1983	5.5	.0	860	AUG. 25	.35	21.0	675
MAR. 02	3.1	.5	760	SEPT. 08	.11	20.5	575
APR. 14	130	1.5	395	SEPT. 16	.60	11.5	450
JUNE 15	11	16.5	665				
05104500 ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN							
OCT. 27, 1982	265	7.0	320	JUNE 14	205	18.0	365
JAN. 05, 1983	9.6	.0	---	AUG. 04	22	23.0	435
APR. 13	286	3.0	220				
05107500 ROSEAU RIVER AT ROSS, MN							
OCT. 26, 1982	611	7.0	340	APR. 12	1070	3.0	220
NOV. 09	272	1.0	340	JUNE 14	226	18.5	380
JAN. 04, 1983	16	.0	655	AUG. 03	43	26.0	405
MAR. 01	14	.5	580				

BEST COPY AVAILABLE

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALTIY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN							
OCT. 26, 1982	749	6.0	345	APR. 12	1370	5.0	---
JAN. 04, 1983	34	.0	740	JUNE 15	339	17.0	405
JAN. 18	30	.5	---	AUG. 02	44	24.5	427
MAR. 01	29	.0	600	SEPT. 08	52	18.5	---
APR. 12	1400	4.5	240				
05124480 KAWISHIWI RIVER NEAR ELY, MN							
OCT. 07, 1982	120	11.0	32	MAY 18	532	12.0	29
JAN. 26, 1983	127	.0	---	JULY 13	251	23.5	37
MAR. 24	70	1.0	37	AUG. 30	101	22.5	<50
05124990 FILSON CREEK NEAR ELY, MN							
OCT. 06, 1982	11	9.0	<50	APR. 27	39	.5	50
NOV. 29	13	.5	41	MAY 17	11	10.0	<50
JAN. 26, 1983	1.3	.0	---	JULY 11	14	24.5	31
MAR. 23	.98	.0	54	AUG. 30	3.8	21.5	<50
APR. 12	20	.0	50	SEPT. 28	3.8	8.0	<50
05127000 KAWISHIWI RIVER NEAR WINTON, MN							
OCT. 06, 1982	1390	---	---	MAY 18, 1983	2010	---	---
05127500 BASSWOOD RIVER NEAR WINTON, MN							
OCT. 20, 1982	3830	---	---	JULY 12, 1983	2590	20.5	54
05128000 MANAKAN RIVER AT OUTLET OF LAC LA CROIX, ONTARIO							
JULY 15, 1983	6280	26.0	<50				
05129115 VERMILLION RIVER NEAR CRANE LAKE, MN							
OCT. 08, 1982	1050	10.0	65	APR. 12	860	4.5	55
NOV. 02	835	5.5	70	MAY 17	856	9.0	70
JAN. 25, 1983	375	.0	75	JULY 18	566	26.5	70
MAR. 21	366	.5	90	AUG. 31	411	24.5	66
05129290 GOLD PORTAGE OUTLET FROM KABETOGAMA LAKE NEAR RAY, MN							
JUNE 21, 1983	322	17.0	95	AUG. 17	577	23.0	88
JUNE 29	454	20.5	90	SEPT. 14	546	15.0	100
JULY 25	594	24.5	92	SEPT. 26	495	14.0	93

BEST COPY AVAILABLE

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALTIY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05130500 STURGEON RIVER NEAR CHISHOLM, MN							
OCT. 04, 1982...	268	10.0	95	MAR. 23.....	55	.0	132
NOV. 26.....	238	.5	60	APR. 13.....	179	3.5	80
DEC. 22.....	90	.0	107	MAY 16.....	176	8.0	100
JAN. 24, 1983...	55	.0	140	JULY 19.....	68	24.0	150
FEB. 15.....	35	.5	160	AUG. 31.....	170	22.0	180
05131500 LITTLE FORK RIVER AT LITTLEFORK, MN							
NOV. 02, 1982...	1010	5.0	113	APR. 25.....	1360	9.5	125
JAN. 06, 1983...	271	.0	200	JUNE 21.....	2110	17.0	130
FEB. 28.....	180	.0	236	AUG. 16.....	280	25.0	225
APR. 12.....	1580	.5	115				
05132000 BIG FORK RIVER AT BIG FALLS, MN							
MAR. 02, 1983...	203	.0	300	JUNE 20.	2630	16.0	150
APR. 11.....	1060	1.0	150	AUG. 15.....	259	23.0	260
APR. 25.....	754	10.0	205				
05133500 RAINY RIVER AT MANITOU RAPIDS, MN							
APR. 26, 1983...	8520	9.0	124	JUNE 22.....	14100	18.0	135
05134200 RAPID RIVER NEAR BAUDETTE, MN							
NOV. 01, 1982...	800	5.0	143	APR. 12.....	600	1.0	115
JAN. 06, 1983...	27	.0	395	APR. 27.....	383	9.0	167
MAR. 03.....	12	.0	465	AUG. 18.....	16	25.0	320

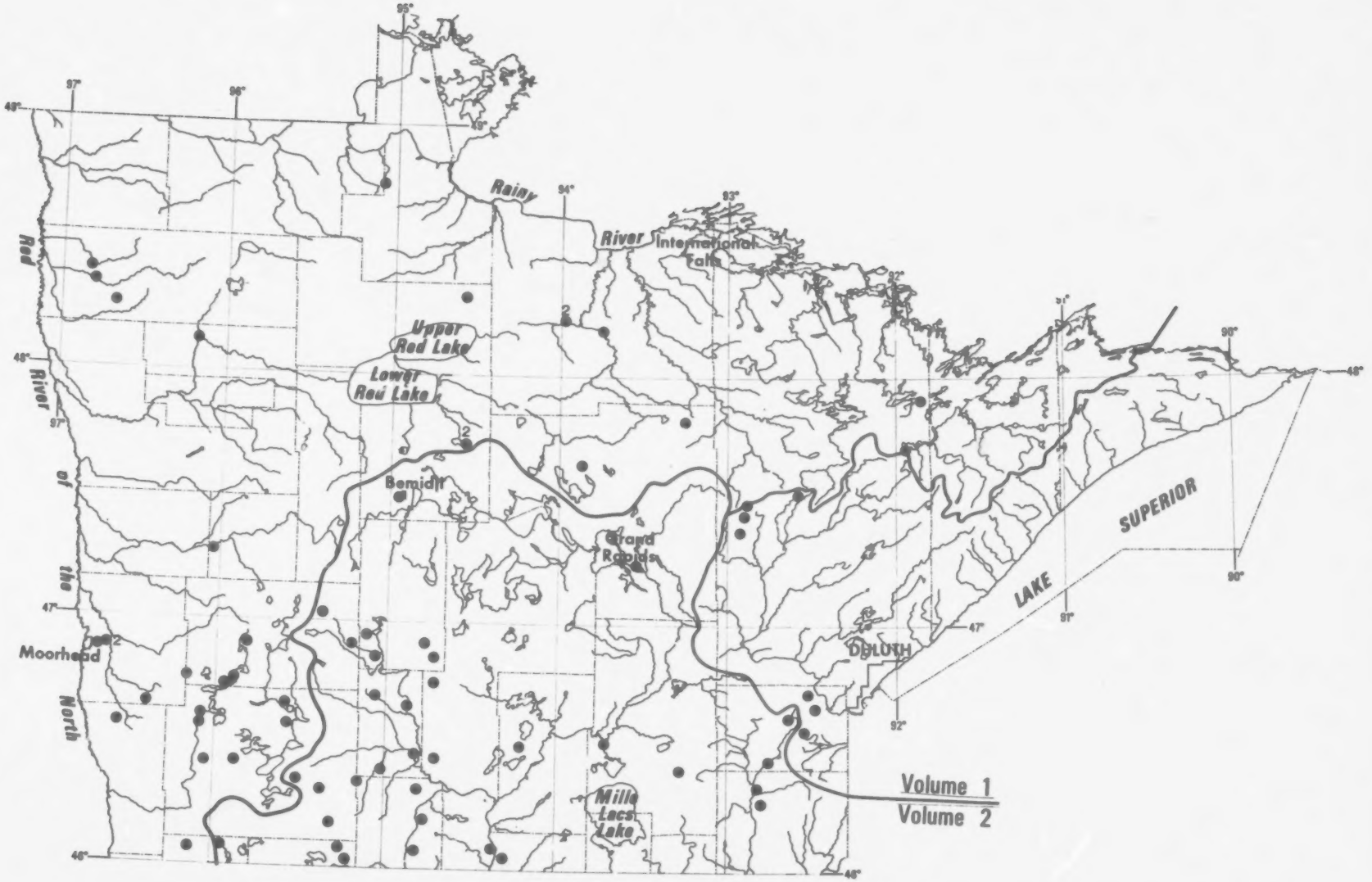
BEST COPY AVAILABLE

BEST COPY AVAILABLE

GROUND-WATER RECORDS

BEST COPY AVAILABLE

BEST COPY AVAILABLE



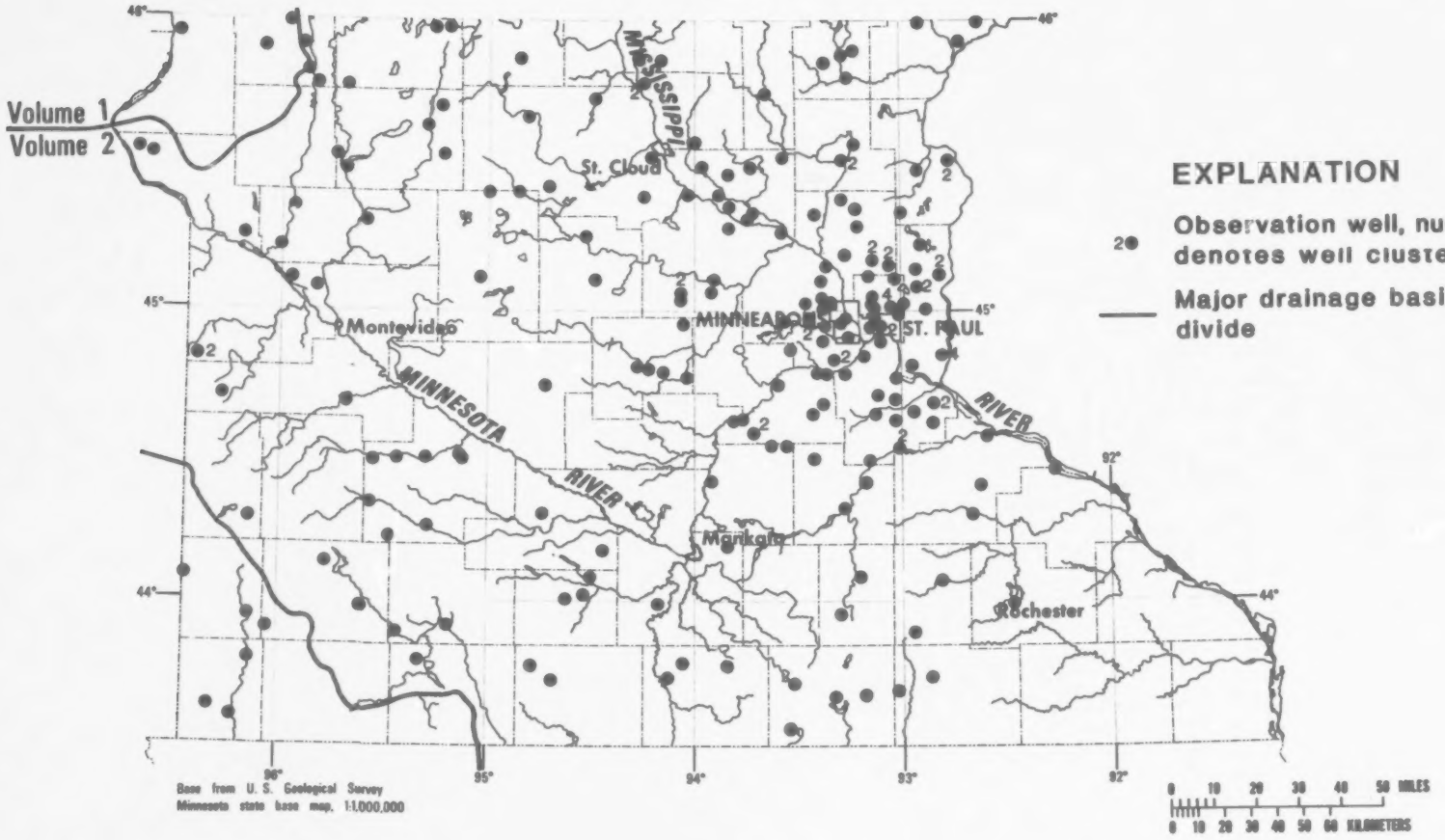


Figure 10.--Location of ground-water wells

BEST COPY AVAILABLE

173

GROUND-WATER LEVELS

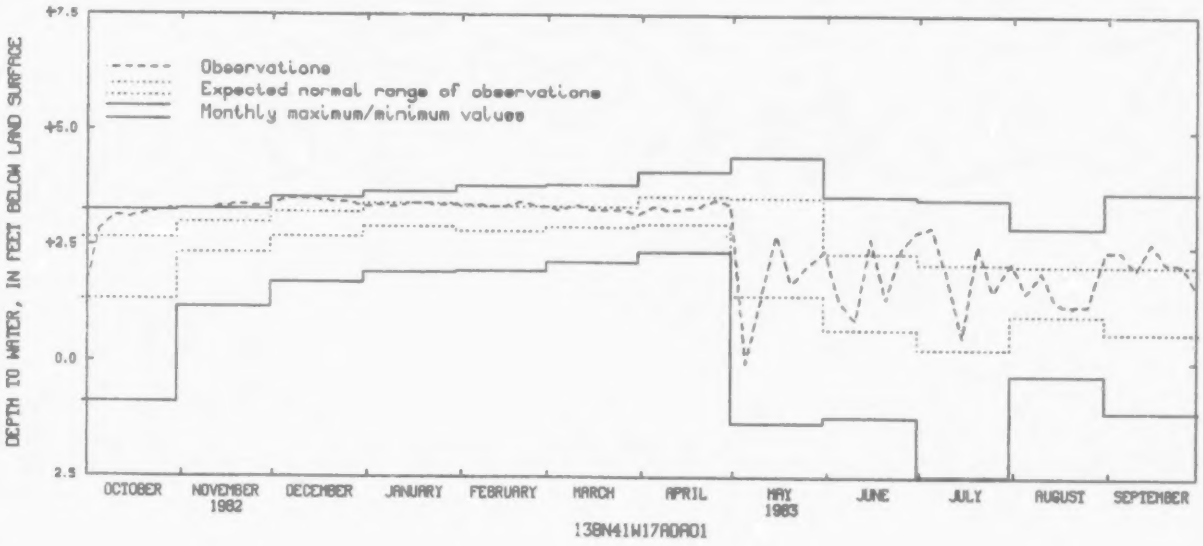
BECKER COUNTY

464613095524801. Local number, 138N41W17ADA01.
LOCATION.--Lat 46°46'13", long 95°52'48", in NE¼SE¼NE¼ sec.17, T.138 N., R.41 W., Hydrologic Unit 09020103, east shore of Lake Sallie.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in (0.15 m), depth 234 ft (71.3 m), screened 222 to 234 ft (67.7 to 71.3 m).
DATUM.--Land-surface datum is 1,333.2 ft (406.4 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 4.40 ft (1.34 m) above land-surface datum.
REMARKS.--Water level affected by pumping of nearby well.
PERIOD OF RECORD.--March 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.44 ft (1.35 m) above land-surface datum, May 23, 27, 1975; lowest, 2.47 ft (0.75 m) below land-surface datum, July 25, 1977.

WATER LEVEL, IN FEET ABOVE OR BELOW (-) LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	2.80	3.30	3.50	3.38	3.39	3.29	3.37	-0.03	1.27	2.92	1.50	2.39
10	3.15	3.30	3.50	3.36	3.37	3.39	3.29	1.38	0.89	1.88	1.95	2.00
15	3.10	3.35	3.50	3.43	3.37	3.29	3.31	2.76	2.66	0.53	1.27	2.58
20	3.20	3.40	3.46	3.41	3.44	3.29	3.36	1.70	1.34	2.53	1.21	2.14
25	3.25	3.35	3.45	3.39	3.37	3.28	3.50	2.06	2.45	1.53	1.22	2.13
EOM	3.30	3.40	3.35	3.40	3.36	3.19	3.40	2.40	2.80	2.15	2.39	1.58

WTR YEAR 1983 HIGHEST 3.70 NOV 8, 1982 LOWEST -0.03 MAY 5, 1983



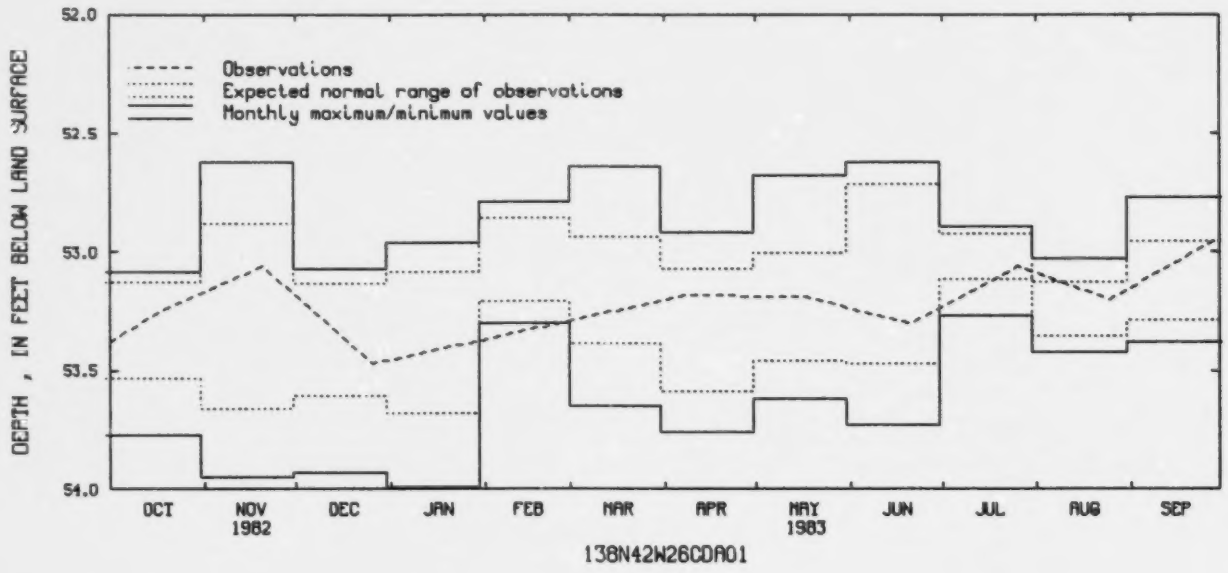
BEST COPY AVAILABLE

BECKER COUNTY--Continued

464401095571301. Local number, 138N42W26CDA01.
LOCATION.--Lat 46°44'01", long 95°57'13", in NE¼SE¼SW¼ sec.26, T.138 N., R.42 W., Hydrologic Unit 09020103, on Don Bullock farm.
Owner: Don Bullock.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 90 ft (27.4 m), screened 88 to 90 ft (26.8 to 27.4 m).
DATUM.--Altitude of land-surface datum is 1,390 ft (424 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 52.62 ft (16.04 m) below land-surface datum, June 13, 1980, Nov. 23, 1980; lowest, 53.99 ft (16.46 m) below land-surface datum, Jan. 22, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 17	53.25	DEC 26	53.47	MAY 17	53.19	JUN 21	53.30	JUL 26	53.06	AUG 25	53.20
NOV 20	53.06	APR 9	53.18								



464550096095901. Local number, 138N43W18CDA01.
LOCATION.--Lat 46°45'50", long 96°09'59", in NE¼SE¼SW¼ sec.18, T.138 N., R.43 W., Hydrologic Unit 09020103, on Fred Kraft farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 77 ft (23.5 m) screened 75 to 77 ft (22.9 to 23.5 m).
DATUM.--Altitude of land-surface datum is 1,420 ft (433 m). Measuring point: Top of casing, 3.75 ft (1.14 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 58.47 ft (17.82 m) below land-surface datum, June 1, 1980; lowest, 60.84 ft (18.54 m) below land-surface datum, Aug. 25, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 17	60.34	DEC 26	60.45	MAY 17	60.51	JUN 21	60.59	JUL 26	60.45	AUG 25	60.84
NOV 20	60.39	APR 9	60.43								

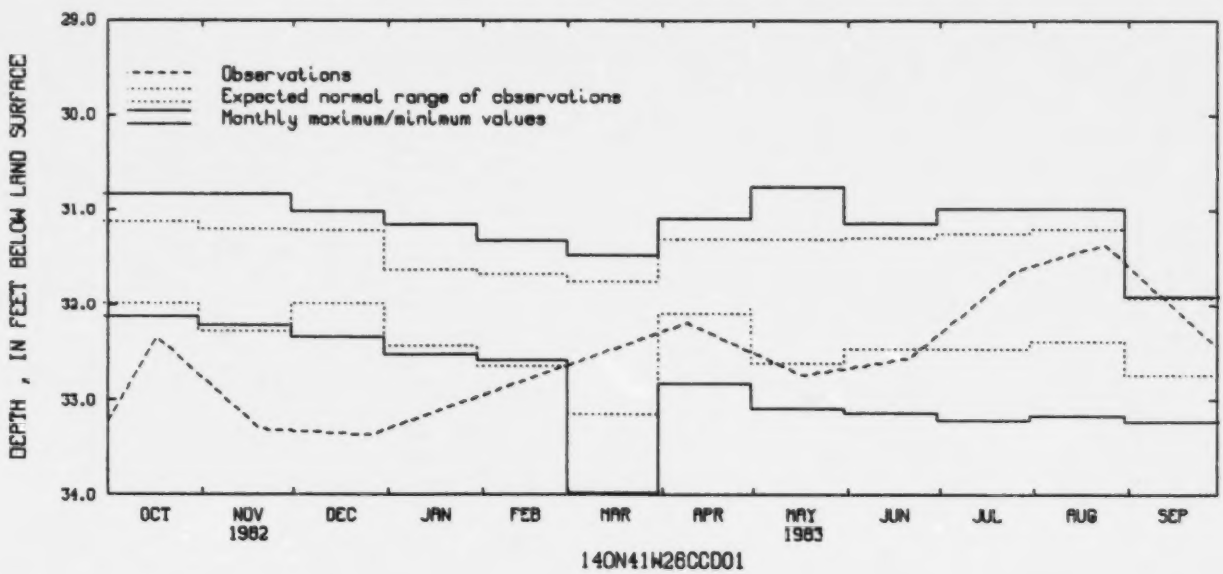
BEST COPY AVAILABLE

BECKER COUNTY--Continued

465422095495501. Local number, 140N41W26CCD01.
LOCATION.--Lat 46°54'22", long 95°49'55", in SE¼SW¼SW¼ sec.26, T.140 N., R.41 W., Hydrologic Unit 09020103, on Paul Scaiie farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 53 ft (16.2 m), screened 51 to 53 ft (15.5 to 16.2 m).
DATUM.--Altitude of land-surface datum is 1,422 ft (433 m). Measuring point: Top of casing, 2.40 ft (0.73 m) above land-surface datum.
PERIOD OF RECORD.--December 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.75 ft (9.37 m) below land-surface datum, May 8, 1978; lowest, 33.98 ft (10.36 m) below land-surface datum, Mar. 21, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 17	32.34	DEC 26	33.37	MAY 17	32.74	JUN 21	32.56	JUL 26	31.64	AUG 25	31.36
NOV 20	33.31	APR 9	32.19								



BELTRAMI COUNTY

474111094331401. Local number, 149N31W25DCD01.
LOCATION.--Lat 47°41'11", long 94°33'14", in SE¼SW¼SE¼ sec.25, T.149 N., R.31 W., Hydrologic Unit 07010101, at Blackduck Lookout Tower.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 2 in (0.05 m), depth 157 ft (47.8 m), screened 154 to 157 ft (46.9 to 47.8 m).
DATUM.--Land-surface datum is 1,450.0 ft (442.0 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 3.10 ft (0.94 m) above land-surface datum.
PERIOD OF RECORD.--July 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 70.63 ft (21.53 m) below land-surface datum, July 28, 1980; lowest, 104.5 ft (31.85 m) below land-surface datum, July 27, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 3	101.8	JAN 7	101.5	MAR 3	102.1	APR 27	102.3	JUN 23	102.3	AUG 19	102.0

BEST COPY AVAILABLE

BELTRAMI COUNTY--Continued

474111094331402. Local number, 149N31W25DCD02.
LOCATION.--Lat 47°41'11", long 94°33'14", in SE¼SW¼SE¼ sec.25, T.149 N., R.31 W., Hydrologic Unit 07010101, at Blackduck Lookout Tower.
Owner: U.S. Geological Survey.
AQUIFER.--Sandy till of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in (0.05 m), depth 65 ft (19.8 m), screened 62 to 65 ft (18.9 to 19.8 m).
DATUM.--Land-surface datum is 1,448.8 ft (441.6 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 3.10 ft (0.94 m) above land-surface datum.
PERIOD OF RECORD.--July 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.51 ft (0.46 m) below land-surface datum, May 21, 1982; lowest, 22.64 ft (6.90 m) below land-surface datum, June 23, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 3	11.44	JAN 7	17.19	MAR 3	21.86	APR 27	21.97	JUN 23	22.64	AUG 19	21.93

481711094331602. Local number, 156N31W36DAA02.
LOCATION.--Lat 48°17'11", long 94°33'16", in NE¼NE¼SE¼ sec.36, T.156 N., R.31 W., Hydrologic Unit 09020302, at Ludlow Lookout Tower.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in (0.05 m), depth 107 ft (32.6 m), screened 104 to 107 ft (31.7 to 32.6 m).
DATUM.--Land-surface datum is 1,195.8 ft (364.5 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 1.90 ft (0.58 m) above land-surface datum.
PERIOD OF RECORD.--July 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.06 ft (0.32 m) below land-surface datum, June 23, 1983; lowest, 4.98 ft (1.52 m) below land-surface datum, Aug. 19, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 1	3.35	APR 27	1.62	JUN 23	1.06	AUG 19	4.98

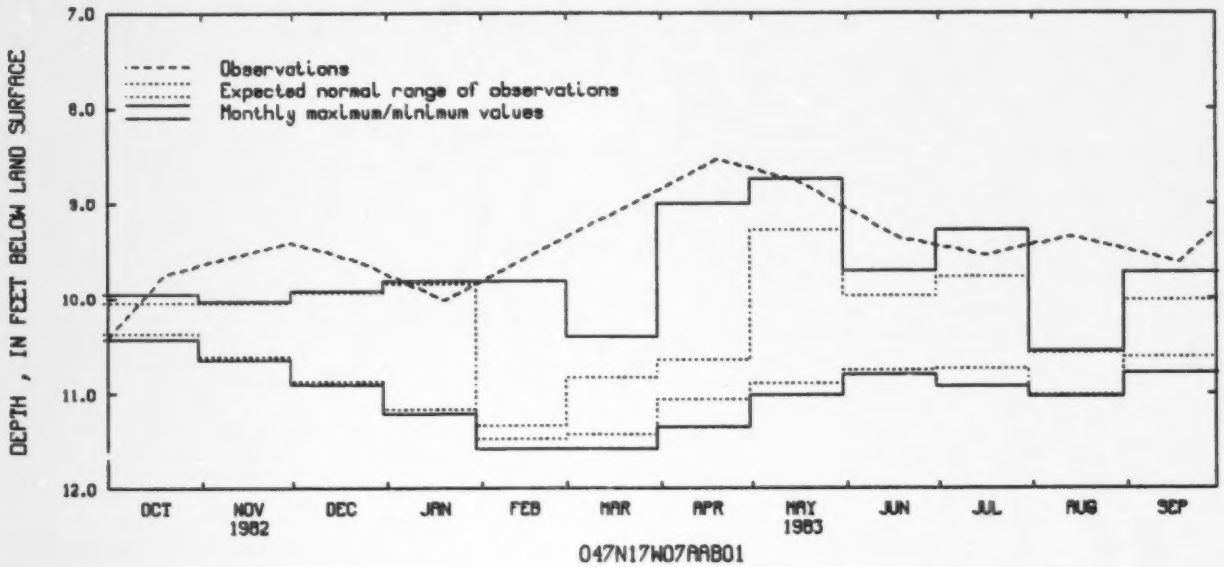
CARLTON COUNTY

463437092313301. Local number, 047N17W07AAB01.
LOCATION.--Lat 46°34'37", long 92°31'33", in NW¼NE¼NE¼ sec.7, T.47 N., R.17 W., Hydrologic Unit 04010301, on Merle Olson farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.04 m), depth 33 ft (10.1 m), screened 31 to 33 ft (9.4 to 10.1 m).
DATUM.--Altitude of land-surface datum is 1,110 ft (338 m). Measuring point: Top of casing, 4.00 ft (1.22 m) above land-surface datum.
PERIOD OF RECORD.--October 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.54 ft (2.60 m) below land-surface datum, Apr. 19, 1983; lowest, 11.58 ft (3.53 m) below land-surface datum, Mar. 29, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 20	9.74	DEC 22	9.60	APR 19	8.54	JUN 18	9.36	AUG 13	9.35	SEP 18	9.62
NOV 30	9.41	JAN 20	10.02	MAY 15	8.75	JUL 16	9.54				

BEST COPY AVAILABLE



463948092280301. Local number, 048N17W02CCC01
LOCATION.--Lat 46°39'48", long 92°28'03", in SW¼SW¼SW¼ sec.2. T.48 N., R.17 W, Hydrologic Unit 04010201, 1.4 mi (2.2 km) west of Carlton.
Owner: U. S. Geological Survey.
AQUIFER.--Surficial Sand of Pleistocene Age.
WELL CHARACTERISTICS.--Board observation water-table well, diameter 1¼ in (0.04 m), depth 28 ft (8.5 m), screened 26 to 28 ft (7.9 to 8.5 m).
DATUM.--Altitude of land-surface datum is 1,130 ft (344 m). Measuring point: Top of casing, 2.30 ft (0.70 m) above land-surface datum.
PERIOD OF RECORD.--August 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 20.92 ft (6.38 m) below land-surface datum, May 15, 1983; lowest, 25.60 ft (7.80 m) below land-surface datum, Mar. 29, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 20	22.76	DEC 22	21.90	APR 19	22.42	JUN 18	21.17	AUG 13	21.30	SEP 18	21.81
NOV 30	22.20	JAN 20	22.42	MAY 15	20.92	JUL 16	21.14				

463446092304901. Local number, 049N17W17ADD01.
LOCATION.--Lat 46°43'46", long 92°30'49", in SE¼SE¼NE¼ sec.17, T.49 N., R.17 W., Hydrologic Unit 04010201, 1.5 mi (2.4 km) west of Cloquet.
Owner: City of Cloquet, well 7.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 48 in (1.22 m), depth 49 ft (14.9 m), screened 39 to 49 ft (11.9 to 14.9 m).
DATUM.--Land-surface datum is 1,263.8 ft (385.2 m) National Geodetic Vertical Datum of 1929. Measuring point: Hole in steel cover, 2.30 ft (0.70 m) above land-surface datum.
PERIOD OF RECORD.--March 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.38 ft (1.94 m) below land-surface datum, May 5, 1982; lowest, 9.05 ft (2.76 m) below land-surface datum, Mar. 7, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 22	7.47	DEC 22	7.41	APR 19	6.78	JUN 18	7.33	AUG 13	7.09	SEP 18	7.38
NOV 30	7.15	JAN 20	7.37	MAY 15	7.04	JUL 16	7.63				

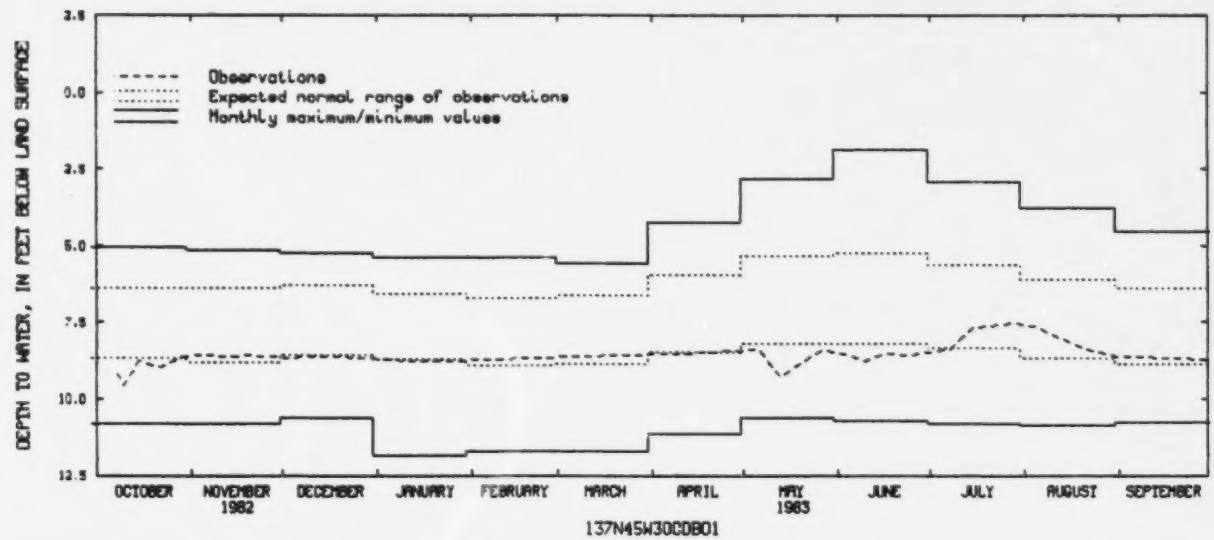
BEST COPY AVAILABLE

CLAY COUNTY

463854096250701. Local number, 137N45W30CDB01.
LOCATION.--Lat 46°38'54", long 96°25'07", in NW¼SE¼SW¼ sec.30, T.137 N., R.45 W., Hydrologic Unit 09020106, in Barnesville.
Owner: City of Barnesville, well 3.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 10 in (0.25 m), depth 73 ft (22.2 m).
DATUM.--Altitude of land-surface datum is 1,022 ft (312 m). Measuring point: Top of casing, 1.50 ft (0.46 m) above land-surface datum.
PERIOD OF RECORD.--January 1949 to January 1975, May 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.86 ft (0.57 m) below land-surface datum, June 9, 1962; lowest, 11.86 ft (3.61 m) below land-surface datum, June 3, 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 8	9.17	DEC 3	8.66	FEB 11	8.90	APR 8	8.52	JUN 10	8.76	AUG 12	7.98
10	9.57	10	8.61	18	8.93	15	8.50	17	8.50	19	8.30
15	8.77	17	8.61	25	8.96	22	8.46	24	8.58	26	8.50
22	8.95	24	8.65	MAR 4	8.87	29	8.42	JUL 1	8.46	SEP 2	8.63
29	8.63	31	8.69	11	8.77	MAY 6	8.38	8	8.37	9	8.63
NOV 5	8.55	JAN 7	8.73	18	8.65	13	9.29	15	7.67	16	8.66
12	8.64	14	8.79	25	8.60	27	8.38	29	7.53	23	8.68
19	8.59	28	8.79	APR 1	8.58	JUN 3	8.54	AUG 5	7.64	30	8.74
26	8.61	FEB 4	8.85								



465237096383901. Local number, 139N47W05CDC01.
LOCATION.--Lat 46°52'37", long 96°38'39", in SW¼SE¼SW¼ sec.5, T.139 N., R.47 W., Hydrologic Unit 09020104, 2.4 mi (3.9 km) east of Dilworth.
Owner: City of Moorhead, MS-1.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 8 in (0.20 m), depth 131 ft (39.9 m), slotted 91 to 107 ft (27.7 to 32.6 m).
DATUM.--Land-surface datum is 916.7 ft (279.4 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder floor, 3.60 ft (1.10 m) above land-surface datum.
REMARKS.--Water level affected by pumping from nearby wells.
PERIOD OF RECORD.--January 1947 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.19 ft (3.72 m) below land-surface datum, July 15, 1947; lowest, 30.78 ft (9.38 m) below land-surface datum, Aug. 28, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	29.93	JAN 27	29.50	MAR 24	29.74	APR 27	29.90	JUN 28	29.91	AUG 28	30.78
DEC 7	30.04										

BEST COPY AVAILABLE

CLAY COUNTY--Continued

465328096391001. Local number, 139N47W06AAA01.
LOCATION.--Lat 46°53'27", long 96°39'08", in NE¼NE¼NE¼ sec.6, T.139 N., R.47 W., Hydrologic Unit 09020104, 2.7 mi (4.3 km) northeast of Dilworth.
Owner: U.S. Geological Survey, M-80.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 3 in (0.08 m), depth 103 ft (31.4 m), casing slotted near bottom.
DATUM.--Altitude of land-surface datum is 915 ft (279 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--July 1949 to April 1966, November 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 16.94 ft (5.16 m) below land-surface datum, July 16, 1949; lowest, 28.98 ft (8.83 m) below land-surface datum, Aug. 28, 1983.

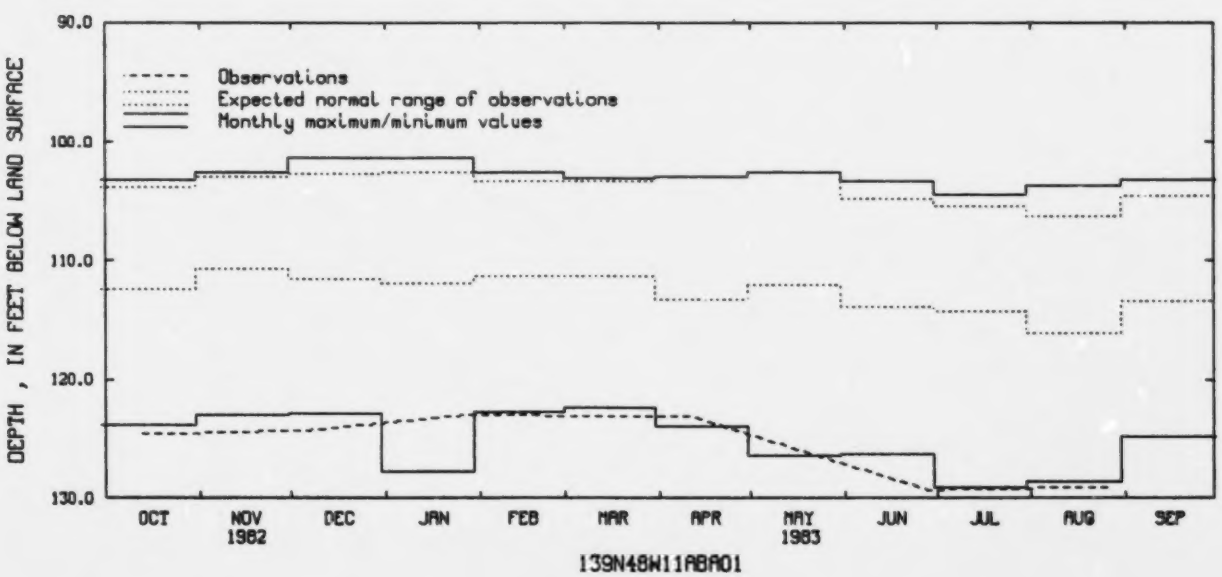
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	28.85	JAN 27	28.70	MAR 24	28.66	APR 27	28.69	JUN 28	28.79	AUG 28	28.98
DEC 7	28.77										

465231096415801. Local number, 139N48W11ABA01.
LOCATION.--Lat 46°52'31", long 96°41'58", in NE¼NW¼NE¼ sec.11, T.139 N., R.48 W., Hydrologic Unit 09020104, at Dilworth.
Owner: City of Dilworth.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 8 in (0.20 m), depth 152 ft (46.3 m).
DATUM.--Altitude of land-surface datum is 908 ft (277 m). Measuring point: Top of recorder platform, 2.40 ft (0.73 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--May 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 101.3 ft (30.88 m) below land-surface datum, Dec. 29, 1965; lowest, 129.3 ft (39.41 m) below land-surface datum, June 28, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	124.6	DEC 7	124.3	JAN 27	123.0	APR 12	123.2	JUN 28	129.3	AUG 28	129.1



BEST COPY AVAILABLE

GRANT COUNTY

455254096051901. Local number, 128N43W21CBB01.
LOCATION.--Lat 45°52'54", long 96°05'19", in NW¼NW¼SW¼ sec.21, T.128 N., R.43 W., Hydrologic Unit 09020101.
Owner: Edward Ellison.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in (0.15 m), depth 56 ft (17.1 m), screened 51 to 56 ft (15.5 to 17.1 m).
DATUM.--Altitude of land-surface datum is 1,090 ft (332 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--October 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 13.42 ft (4.09 m) below land-surface datum, Feb. 24, 1981; lowest, 13.80 ft (4.21 m) below land-surface datum, May 26, 1981.

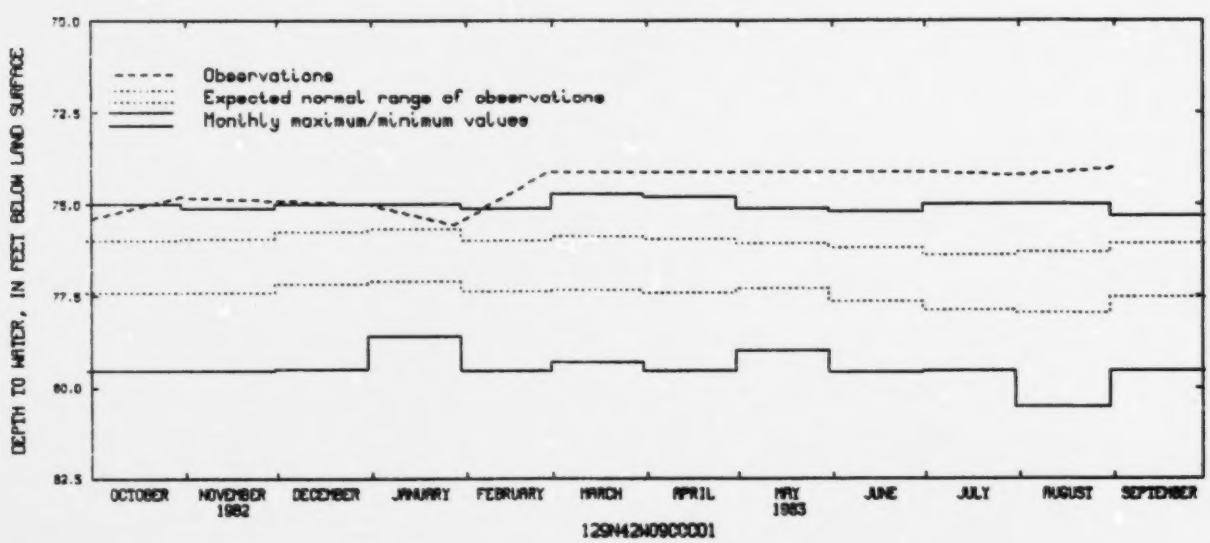
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 21	13.55	DEC 15	13.56	APR 5	13.49	MAY 4	13.54	JUN 22	13.58	JUL 12	13.57
NOV 16	13.56	MAR 7	13.47								

455932095582601. Local number, 129N42W09CCC01.
LOCATION.--Lat 45°59'32", long 95°58'26", in SW¼SW¼SW¼ sec.9, T.129 N., R.42 W., Hydrologic Unit 09020102, in Elbow Lake.
Owner: City of Elbow Lake, old well 2.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in (0.30 m), depth 214 ft (65.2 m), screened 200 to 220 ft (61.0 to 67.1 m).
DATUM.--Altitude of land-surface datum is 1,222 ft (372 m). Measuring point: Top of platform, 1.40 ft (0.43 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--February 1964 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 74.00 ft (22.56 m) below land-surface datum, Sept. 1, 1983; lowest, 80.54 ft (24.55 m) below land-surface datum, Aug. 31, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 30	74.80	DEC 31	75.00	FEB 28	74.10	MAY 2	74.10	JUN 30	74.10	SEP 1	74.00
NOV 30	74.90	JAN 28	75.55	APR 1	74.10	27	74.10	AUG 1	74.20		



BEST COPY AVAILABLE

GRANT COUNTY--Continued

460249096094301. Local number, 130N44W25BCB01.
LOCATION.--Lat 46°02'49", long 96°09'43", in NW¼SW¼NW¼ sec.25, T.130 N., R.44 W., Hydrologic Unit 09020101.
Owner: Adams Bros.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in (0.30 m), depth 105 ft (32.0 m), screened 85 to 105 ft (25.9 to 32.0 m).
DATUM.--Altitude of land-surface datum is 1,092 ft (333 m). Measuring point: Opening in casing, 0.20 ft (0.06 m) above land-surface datum.
PERIOD OF RECORD.--June 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 35.80 ft (10.91 m) below land-surface datum, June 16, 1980; lowest, 61.97 ft (18.89 m) below land-surface datum, Aug. 22, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

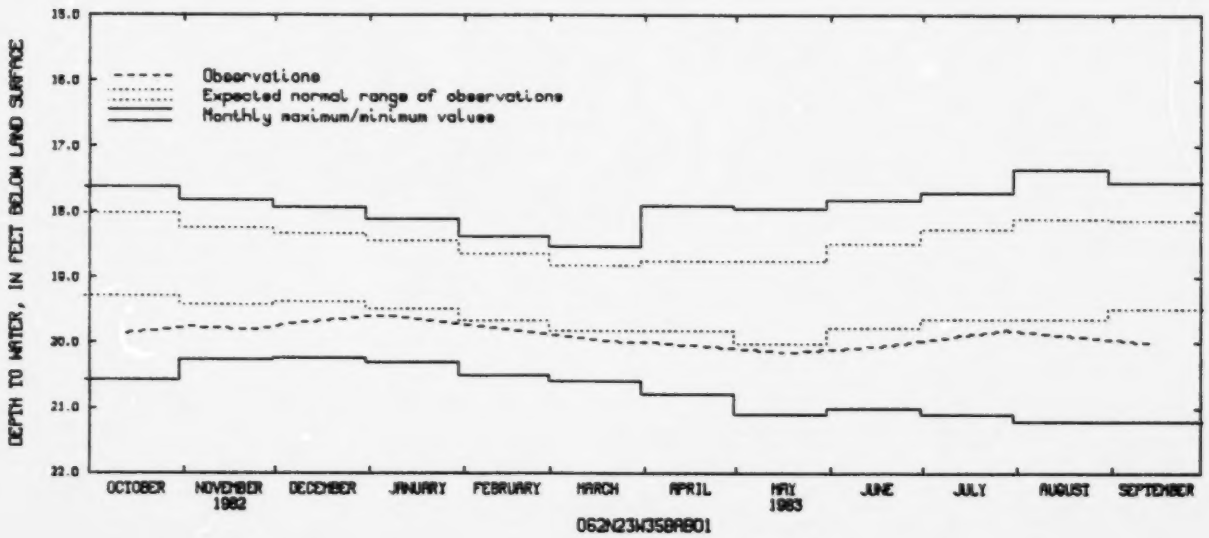
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 21	38.19	DEC 15	38.19	APR 5	38.19	MAY 4	38.19	JUN 22	39.54	JUL 12	39.04
NOV 16	38.20	MAR 7	38.18								

ITASCA COUNTY

474917093144601. Local number, 062N23W35BAB01.
LOCATION.--Lat 47°49'17", long 93°14'46", in NW¼NE¼NW¼ sec.35, T.62 N., R.23 W., Hydrologic Unit 09030005, at Thistledew Ranger Station.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 29 ft (8.8 m), screened 27 to 29 ft (8.2 to 8.8 m).
DATUM.--Altitude of land-surface datum is 1,393 ft (425 m). Measuring point: Top of casing, 3.30 ft (1.01 m) above land-surface datum.
REMARKS.--Measured weekly by State Forestry personnel.
PERIOD OF RECORD.--September 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.35 ft (5.29 m) below land-surface datum, Aug. 20, 1975; lowest, 21.22 ft (6.47 m) below land-surface datum, Aug. 24, Sept. 7, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	19.85	DEC 7	19.70	MAR 15	19.95	APR 20	20.05	MAY 17	20.15	JUL 28	19.80
NOV 4	19.75	30	19.60	30	20.00	MAY 5	20.10	JUN 17	20.05	SEP 14	20.00
24	19.80	JAN 11	19.60	APR 5	20.00						



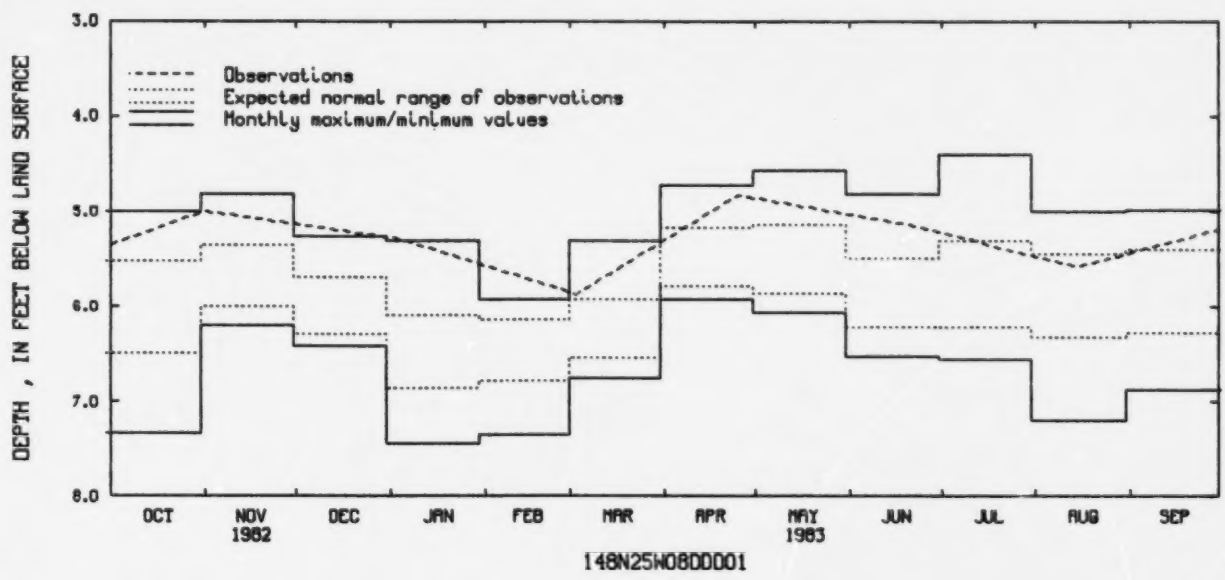
BEST COPY AVAILABLE

ITASCA COUNTY--Continued

473840093515101. Local number, 148N25W08DDD01.
LOCATION.--Lat 47°38'40", long 93°51'51", in SE¼SE¼SE¼ sec.8, T.148 N., R.25 W., Hydrologic Unit 09030006, at Spring Lake.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 10 ft (3.0 m), screened 8 to 10 ft (2.4 to 3.0 m).
DATUM.--Altitude of land-surface datum is 1,350 ft (411 m). Measuring point: Top of casing, 3.40 ft (1.04 m) above land-surface datum.
PERIOD OF RECORD.--September 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.40 ft (1.34 m) below land-surface datum, July 13, 1979; lowest, 7.44 ft (2.27 m) below land-surface datum, Jan. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 1	5.00	JAN 4	5.29	MAR 3	5.87	APR 25	4.83	JUN 20	5.14	AUG 15	5.58



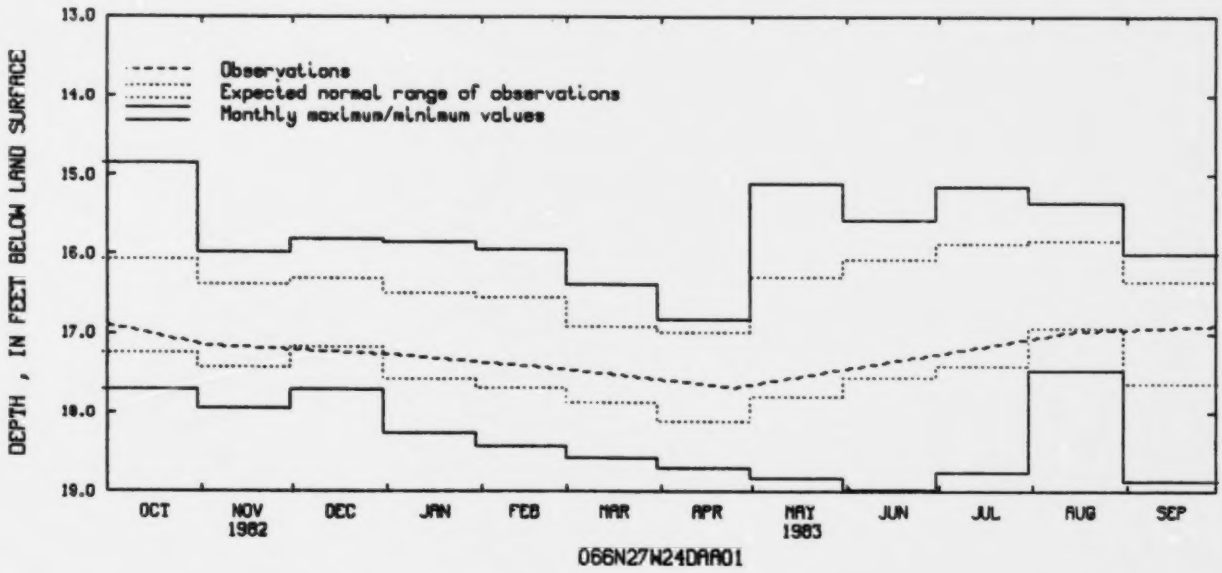
BEST COPY AVAILABLE

KOOCHICHING COUNTY

481148093445601. Local number, 066N27W24DAA01.
LOCATION.--Lat 48°11'48", long 93°44'56", in NE¼NE¼SE¼ sec.24, T.66 N., R.27 W., Hydrologic Unit 09030006, 2.5 mi (4.0 km) east of Big Falls.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 22 ft (6.7 m), casing perforated near bottom.
DATUM.--Altitude of land-surface datum is 1,234 ft (376 m). Measuring point: Top of casing, 3.12 ft (0.95 m) above land-surface datum.
PERIOD OF RECORD.--December 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 14.85 ft (4.53 m) below land-surface datum, Oct. 4, 1979; lowest, 18.98 ft (5.78 m) below land-surface datum, June 13, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	17.15	JAN 4	17.27	MAR 2	17.46	APR 25	17.68	AUG 15	16.97



481345093582801. Local number, 155N26W21DAA01.
LOCATION.--Lat 48°13'45", long 93°58'28", in NE¼NE¼SE¼ sec.21, T.155 N., R.26 W., Hydrologic Unit 09030006, in Pine Island State Forest.
Owner: U.S. Geological Survey.
AQUIFER.--Till of Pleistocene Age.
WELL CHARACTERISTICS.--Driven observation artesian well, diameter 1¼ in (0.03 m), depth 11 ft (3.4 m), screened 8 to 11 ft (2.4 to 3.4 m).
DATUM.--Altitude of land-surface datum is 1,208 ft (368 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
REMARKS.--Water level subject to freezing during winter periods.
PERIOD OF RECORD.--October 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.65 ft (0.20 m) above land-surface datum, Dec. 8, 1975; lowest, 3.97 ft (1.21 m) below land-surface datum, Feb. 7, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	0.60	JAN 4	0.65	MAR 2	1.96	APR 25	1.43	JUN 20	0.50	AUG 15	2.38

BEST COPY AVAILABLE

KOOCHICHING COUNTY--Continued

481345093582802. Local number, 155N26W21DAA02.
LOCATION.--Lat 48°13'45", long 93°58'28", in NE¼NE¼SE¼ sec.21, T.155 N., R.26 W., Hydrologic Unit 09030006, in Pine Island State Park.
Owner: U.S. Geological Survey.
AQUIFER.--Peat of Quaternary Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in (0.05 m), depth 3 ft (0.9 m), screened 0 to 3 ft (0.0 to 0.9 m).
DATUM.--Altitude of land-surface datum is 1,208 ft (368 m). Measuring point: Top of plastic casing, 2.50 ft (0.76 m) above land-surface datum.
PERIOD OF RECORD.--October 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.40 ft (0.43 m) above land-surface datum, June 20, 1983; lowest, dry below land-surface datum, Oct. 4, 1976 to Mar. 21, 1977; Aug. 25, 1980.

WATER LEVEL, IN FEET BELOW OR ABOVE (+) LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

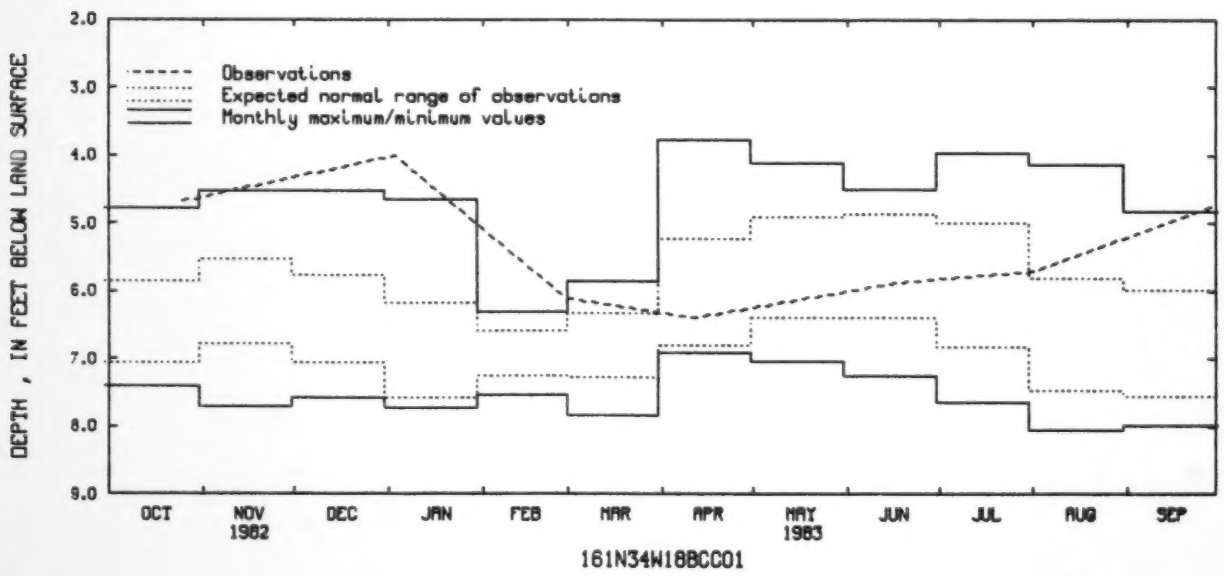
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 2	+0.70	APR 25	+0.59	JUN 20	+1.40	AUG 15	0.00

LAKE OF THE WOODS COUNTY

484552095052401. Local number, 161N34W18BCC01.
LOCATION.--Lat 48°45'52", long 95°05'24", in SW¼SW¼NW¼ sec.18, T.161 N., R.34 W., Hydrologic Unit 09030009, 2.4 mi (3.9 km) south of Roosevelt.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), [illegible] 11 ft (3.4 m), screened 9 to 11 ft (2.7 to 3.4 m).
DATUM.--Altitude of land-surface datum is 1,210 ft (369 m). Measuring point: Top [illegible] 4.60 ft (1.40 m) above land-surface datum.
PERIOD OF RECORD.--September 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.76 ft (1.15 m) below land-surface datum, Apr. 27, 1978; lowest, 8.05 ft (2.45 m) below land-surface datum, Aug. 25, 1972.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 25	4.68	JAN 3	4.01	FEB 28	6.10	APR 11	6.40	JUN 18	5.87	AUG 1	5.71



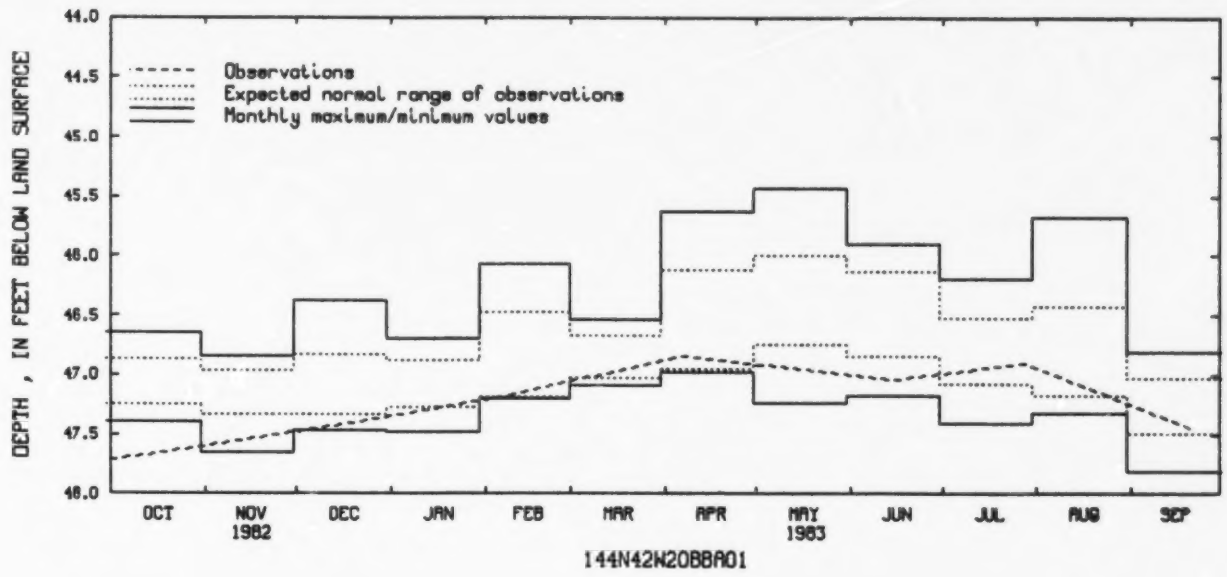
BEST COPY AVAILABLE

MAHNOMEN COUNTY

471653096020301. Local number, 144N42W20BBA01.
LOCATION.--Lat 47°16'53", long 96°02'03", in NE¼NW¼NW¼ sec.20, T.144 N., R.42 W., Hydrologic Unit 09020108, about 3 mi (4.8 km) southwest of Mahnomen.
Owner: Tom Wendt.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in (0.10 m), depth 130 ft (39.6 m).
DATUM.--Altitude of land-surface datum is 1,197 ft (365 m). Measuring point: Top of casing, 1.60 ft (0.49 m) above land-surface datum.
PERIOD OF RECORD.--August 1964 to September 1969, August 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 45.43 ft (13.85 m) below land-surface datum, May 18, 1966; lowest, 47.81 ft (14.57 m) below land-surface datum, Sept. 16, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 21	47.72	FEB 9	47.17	APR 7	46.84	JUN 15	47.04	JUL 28	46.90	SEP 21	47.45
DEC 16	47.42										



MARSHALL COUNTY

481604096391501. Local number, 155N47W11AAA03.
LOCATION.--Lat 48°16'04", long 96°39'15", in NE¼NE¼NE¼ sec.11, T.155 N., R.47 W., Hydrologic Unit 09020309, 6.5 mi (10.5 km) northeast of Warren.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in (0.15 m), depth 86 ft (26.2 m), screened 83 to 86 ft (25.3 to 26.2 m).
DATUM.--Altitude of land-surface datum is 905 ft (276 m). Measuring point: Wood floor of instrument shelter, 3.10 ft (0.94 m) above land-surface datum.
REMARKS.--Water level affected by pumping from nearby city well.
PERIOD OF RECORD.--October 1956 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.83 ft (1.78 m) below land-surface datum, Feb. 26, 1958; lowest, 34.62 ft (10.55 m) below land-surface datum, Sept. 24, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 28	17.80	JAN 5	17.27	MAR 2	17.37	APR 14	17.41	JUN 15	17.33	AUG 9	17.87

BEST COPY AVAILABLE

482048096481901. Local number, 156N48W10DAA02.
LOCATION.--Lat 48°20'48", long 96°48'19", in NE¼NE¼SE¼ sec.10, T.156 N., R.48 W., Hydrologic Unit 09020309, northeast of Argyle.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 26 ft (7.9 m), screened 24 to 26 ft (7.3 to 7.9 m).
DATUM.--Altitude of land-surface datum is 851 ft (259 m). Measuring point: Top of casing, 4.00 ft (1.22 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--September 1963 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.28 ft (1.00 m) below land-surface datum, Oct. 28, 1982; lowest, 11.53 ft (3.51 m) below land-surface datum, Mar. 9, 1977.

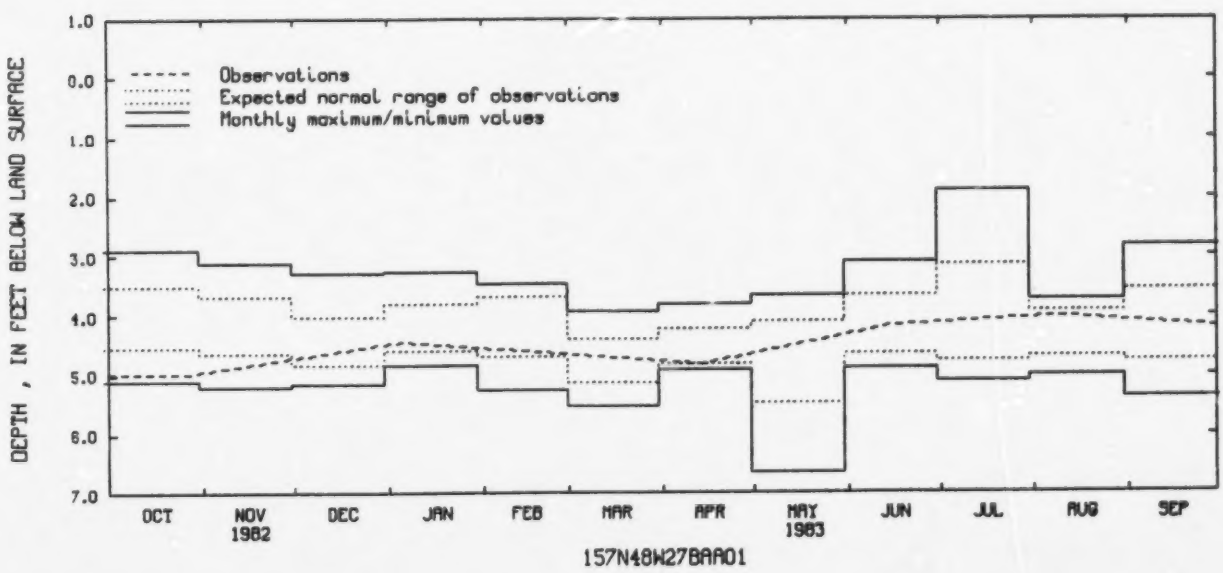
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 28	3.28	JAN 5	4.84	MAR 2	5.42	APR 14	4.71	JUN 15	4.13	AUG 9	4.82

482354096501001. Local number, 157N48W27BAA01.
LOCATION.--Lat 48°23'54", long 96°50'10", in NE¼NE¼NW¼ sec.27, T.157 N., R.48 W., Hydrologic Unit 09020311, 4.3 mi (6.9 km) north of Argyle.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation artesian well, diameter 1¼ in (0.03 m), depth 24 ft (7.3 m), screened 22 to 24 ft (6.7 to 7.3 m).
DATUM.--Altitude of land-surface datum is 844 ft (257 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--October 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.88 ft (0.57 m) below land-surface datum, July 29, 1975; lowest, 6.65 ft (2.03 m) below land-surface datum, May 27, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 28	4.97	JAN 5	4.44	APR 14	4.81	JUN 15	4.17	AUG 9	4.01



BEST COPY AVAILABLE

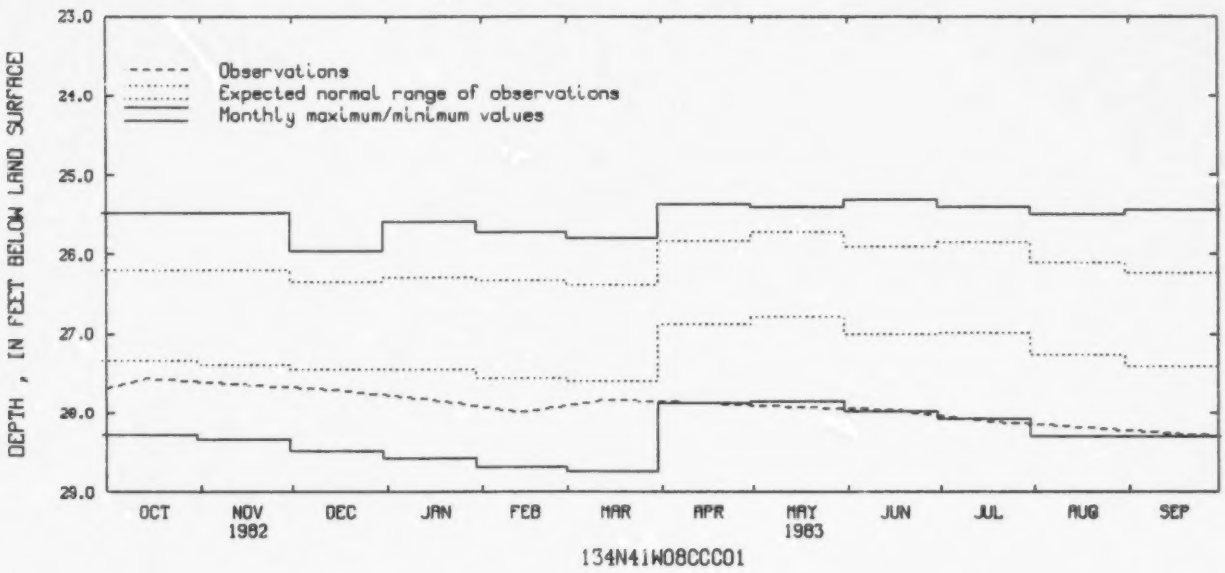
GROUND-WATER LEVELS

OTTER TAIL COUNTY

462538095530201. Local number, 134N41W08CCC01.
LOCATION.--46°25'38", long 95°53'02", in SW¼SW¼SW¼ sec.8, T.134 N., R.41 W., Hydrologic Unit 09020103, 0.9 mi (1.4 km) west of County Roads 35 and 22.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in (0.05 m), depth 43 ft (13.1 m), screened 40 to 43 ft (12.2 to 13.1 m).
DATUM.--Altitude of land-surface datum is 1,368 ft (417 m). Measuring point: Top of casing, 1.70 ft (0.52 m) above land-surface datum.
PERIOD OF RECORD.--November 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 25.31 ft (7.71 m) below land-surface datum, June 1, 1974; lowest, 28.73 ft (8.76 m) below land-surface datum, Mar. 15, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 14	27.56	DEC 13	27.70	FEB 14	27.99	APR 14	27.87	JUN 15	27.96	AUG 16	28.18
NOV 19	27.65	JAN 13	27.82	MAR 14	27.83	MAY 17	27.93	JUL 14	28.10	SEP 19	28.27



462522096031901. Local number, 134N43W14ADB01.
LOCATION.--Lat 46°25'22", long 96°03'19", in NW¼SE¼NE¼ sec.14, T.134 N., R.43 W., Hydrologic Unit 09020103, on Ron Heikes farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 50 ft (15.2 m), screened 48 to 50 ft (14.6 to 15.2 m).
DATUM.--Altitude of land-surface datum is 1,280 ft (390 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.04 ft (7.33 m) below land-surface datum, May 2, 1980; lowest, 26.52 ft (8.08 m) below land-surface datum, Jan. 2, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 17	26.13	DEC 26	26.27	MAY 17	25.90	JUN 21	25.95	JUL 26	25.90	AUG 25	26.33
NOV 20	26.13	APR 9	26.09								

BEST COPY AVAILABLE

463418095334201. Local number, 136N39W23DCC01.
LOCATION.--Lat 46°34'18", long 95°33'42", in SW¼SW¼SE¼ sec.23, T.136 N., R.39 W., Hydrologic Unit 09020103, at Perham dump.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 26 ft (7.9 m), screened 24 to 27 ft (7.3 to 7.9 m).
DATUM.--Altitude of land-surface datum is 1,350 ft (411 m). Measuring point: Top of casing, 1.00 ft (0.30 m) above land-surface datum.
PERIOD OF RECORD.--November 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 9.90 ft (3.02 m) below land-surface datum, Aug. 10, 1972; lowest, 16.67 ft (5.08 m) below land-surface datum, Feb. 9, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 21	14.80	DEC 16	15.15	FEB 10	13.90	APR 7	14.18	JUN 15	well destroyed

463650096042801. Local number, 136N43W10AAA01.
LOCATION.--Lat 46°36'50", long 96°04'28", in NE¼NE¼NE¼ sec.10, T.136 N., R.43 W., Hydrologic Unit 09020103, on Oliver Haugrud farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 22 ft (6.7 m), screened 20 to 22 ft (6.1 to 6.7 m).
DATUM.--Altitude of land-surface datum is 1,322 ft (403 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--July 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.89 ft (2.10 m) below land-surface datum, Apr. 16, 1980; lowest, 8.67 ft (2.64 m) below land-surface datum, Dec. 1, 1980, Sept. 11, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 17	8.35	DEC 26	8.52	MAY 17	8.33	JUN 21	8.49	JUL 26	8.22	AUG 25	8.45
NOV 20	8.46	APR 9	8.26								

463430096050201. Local number, 136N43W22CDA02.
LOCATION.--Lat 46°34'30", long 96°05'02", in NE¼SE¼SW¼ sec.22, T.136 N., R.43 W., Hydrologic Unit 09020103, at Pelican Rapids.
Owner: City of Pelican Rapids, well 2.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 10 in (0.25 m), depth 113 ft (34.4 m), screened 87 to 113 ft (26.5 to 34.4 m).
DATUM.--Land-surface datum is 1,354 ft (412.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Bottom lip of access pipe, 2.30 ft (0.70 m) above land-surface datum.
PERIOD OF RECORD.--March 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 46.97 ft (14.32 m) below land-surface datum, June 20, 1979; lowest, 55.33 ft (16.86 m) below land-surface datum, Oct. 13, 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 25	48.69	DEC 7	48.89	APR 27	48.53	JUN 29	48.75	AUG 28	48.73	SEP 21	48.85
29	48.67	APR 6	48.60								

BEST COPY AVAILABLE

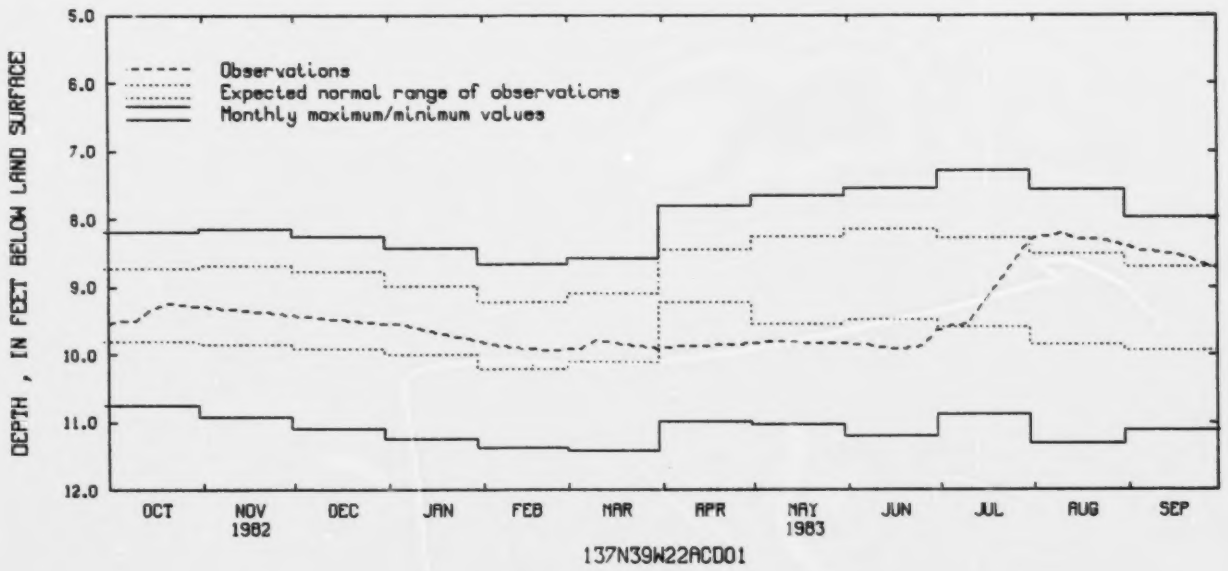
OTTER TAIL COUNTY--Continued

463956095352601. Local number, 137N39W22ACD01.
LOCATION.--Lat 46°39'56", long 95°35'26", in SE¼SW¼NE¼ sec.22, T.137 N., R.39 W., Hydrologic Unit 09020103, 4.5 mi (7.2 km) north of Perham.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in (0.10 m), depth 24 ft (7.3 m), screened 21 to 24 ft (6.4 to 7.3 m).
DATUM.--Altitude of land-surface datum is 1,370 ft (418 m). Measuring point: Top of casing, 0.50 ft (0.15 m) above land-surface datum.
PERIOD OF RECORD.--December 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.29 ft (2.22 m) below land-surface datum, July 15, 1975; lowest, 11.41 ft (3.48 m) below land-surface datum, Mar. 10, 15, 1977.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	9.51	.....	.....	9.55	9.85	9.90	9.87	9.81	9.84	9.57	8.25	8.46
10	9.49	.....	.....	9.60	9.89	9.78	9.87	9.81	9.87	9.55	8.20	8.48
15	9.34	.....	9.48	9.65	9.91	9.81	9.86	9.81	9.91	.....	8.29	8.52
20	9.24	.....	9.50	9.70	9.92	9.85	9.84	9.82	9.90	.....	8.30	8.56
25	.....	.....	9.52	9.75	9.92	9.87	9.84	9.83	9.87	.....	8.32	8.66
EOM	.....	.....	9.54	9.80	9.92	9.91	9.83	9.83	9.64	8.29	8.40	8.72

WTR YEAR 1983 HIGHEST 8.19 AUG 9, 1983 LOWEST 9.92 FEB 20-28, 1983



PENNINGTON COUNTY

480707096103501. Local number, 154N43W33ADA01.
LOCATION.--Lat 48°07'07", long 96°10'35", in NE¼SE¼NE¼ sec.33, T.154 N., R.43 W., Hydrologic Unit 09020303, in Thief River Falls.
Owner: Industrial Enterprises.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 3 in (0.08 m), depth 124 ft (37.8 m).
DATUM.--Altitude of land-surface datum is 1,127 ft (344 m). Measuring point: Top of casing, at land-surface datum.
PERIOD OF RECORD.--February 1965 to September 1969, August 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 34.40 ft (10.49 m) below land-surface datum, Feb. 21, 1967, Mar. 18, 1968; lowest, 39.16 ft (11.94 m) below land-surface datum, Oct. 7, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JUN 13	36.41	JUN 15	36.41	AUG 10	35.16

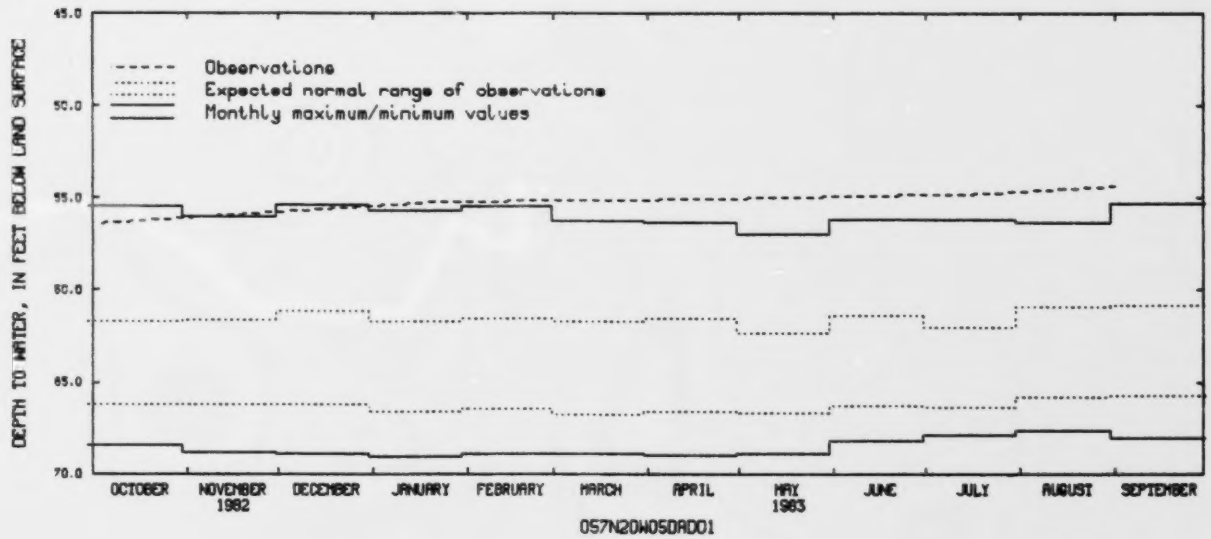
BEST COPY AVAILABLE

ST. LOUIS COUNTY

472638092533601. Local number, 057N20W05DAD01.
LOCATION.--Lat 47°26'38", long 92°53'36", in SE¼NE¼SE¼ sec.5, T.57 N., R.20 W., Hydrologic Unit 04010201, 2.5 mi (4.0 km) east of Hibbing.
Owner: Burlington Northern, Inc.
AQUIFER.--Biwabik Iron Formation of Middle Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in (0.30 m), depth 430 ft (131 m), cased to 315 ft (96.0 m).
DATUM.--Altitude of land-surface datum is 1,470 ft (448 m). Measuring point: Top of platform, 1.20 ft (0.37 m) above land-surface datum.
PERIOD OF RECORD.--August 1955 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 54.35 ft (16.57 m) below land-surface datum, Aug. 31, 1983; lowest, 69.07 ft (21.05 m) below land-surface datum, Jan. 15, 1965.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 4	56.37	JAN 24	55.19	MAR 23	55.12	MAY 16	54.97	JUL 19	54.76	AUG 31	54.35
NOV 26	55.80										



472230092561001. Local number, 057N20W31DBC01.
LOCATION.--Lat 47°22'30", long 92°56'10", in SW¼NW¼SE¼ sec.31, T.57 N., R.20 W., Hydrologic Unit 04010201, 1.4 mi (2.25 km) south of Hibbing.
Owner: Mesaba County Club.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian and water-table well, diameter 18 in (0.46 m), depth 92 ft (28.0 m), screened 82 to 92 ft (25.0 to 28.0 m).
DATUM.--Altitude of land-surface datum is 1,391 ft (424 m). Measuring point: Hole east side of pump base, 3.00 ft (0.91 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--February 1958 to March 1965, July 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.75 ft (1.48 m) below land-surface datum, May 23, 1962; lowest, 15.05 ft (3.56 m) below land-surface datum, June 30, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 19832

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 4	5.24	JAN 24	6.40	MAR 23	7.04	MAY 16	4.75	JUN 2	5.02	SEP 1	5.10
NOV 26	5.30										

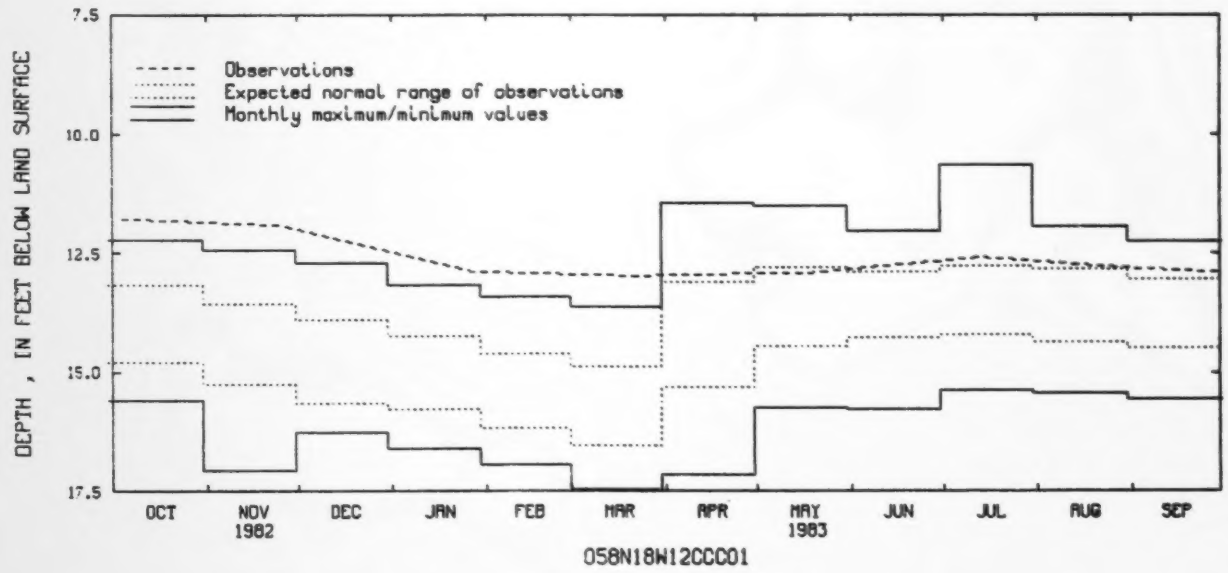
BEST COPY AVAILABLE

ST. LOUIS COUNTY--Continued

473102092345001. Local number, 058N18W12CCC01.
LOCATION.--Lat 47°31'02", long 92°34'50", in SW¼SW¼SW¼ sec.12, T.58 N., R.18 W., Hydrologic Unit 04010201, 1 mi (1.6 km) west of Virginia.
Owner: U.S. Steel Corp.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in (0.15 m), depth 97 ft (29.6 m), slotted casing between 67 to 97 ft (20.4 to 29.6 m).
DATUM.--Land-surface datum is 1,427.5 ft (435.1 m) National Geodetic Vertical Datum of 1929. Measuring point: Edge of vent pipe, 1.90 ft (0.58 m) above land-surface datum.
PERIOD OF RECORD.--December 1954 to July 1964, July 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.64 ft (3.24 m) below land-surface datum, July 20, 1957; lowest, 17.47 ft (5.32 m) below land-surface datum, Apr. 2, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 4	11.77	JAN 27	12.88	MAR 21	12.97	MAY 19	12.90	JUL 14	12.58	SEP 1	12.81
NOV 26	11.91										



473011092524301. Local number, 058N20W16DBC01.
LOCATION.--Lat 47°30'11", long 92°52'43", in SW¼NW¼SE¼ sec.16, T.58 N., R.20 W., Hydrologic Unit 04010201, in Chisholm.
Owner: City of Chisholm.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in (0.30 m), depth 40 ft (12.2 m), screened 30 to 40 ft (9.1 to 12.2 m).
DATUM.--Altitude of land-surface datum is 1,500 ft (457 m). Measuring point: Top of wood platform, 1.70 ft (0.52 m) above land-surface datum.
REMARKS.--Water level affected by pumping. Water-level subject to freezing during winter months.
PERIOD OF RECORD.--August 1953 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.23 ft (0.07 m) below land-surface datum, May 10, 1954; lowest, 15.60 ft (4.75 m) below land-surface datum, Mar. 23-24, 1957.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 4	1.38	NOV 26	1.42	MAY 16	1.86	JUL 19	2.78	AUG 31	1.93

BEST COPY AVAILABLE

ST. LOUIS COUNTY--Continued

474253091574101. Local number, 060N13W01BBA01.
LOCATION.--Lat 47°42'53", long 91°57'41", in NE¼NW¼NW¼ sec.1, T.60 N., R.13 W., Hydrologic Unit 09030001, at Babbitt water tower.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in (0.05 m), depth 30 ft (9.1 m), screened 27 to 30 ft (8.2 to 9.1 m).
DATUM.--Altitude of land-surface datum is 1,485 ft (453 m). Measuring point: Top of 3 in (0.08 m) pipe, 4.00 ft (1.22 m) above land-surface datum.
PERIOD OF RECORD.--October 1975 to June 1978, July 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 20.38 ft (6.21 m) below land-surface datum, Jan. 1, 1983; lowest, 26.03 ft (7.93 m) below land-surface datum, June 14, 1977.

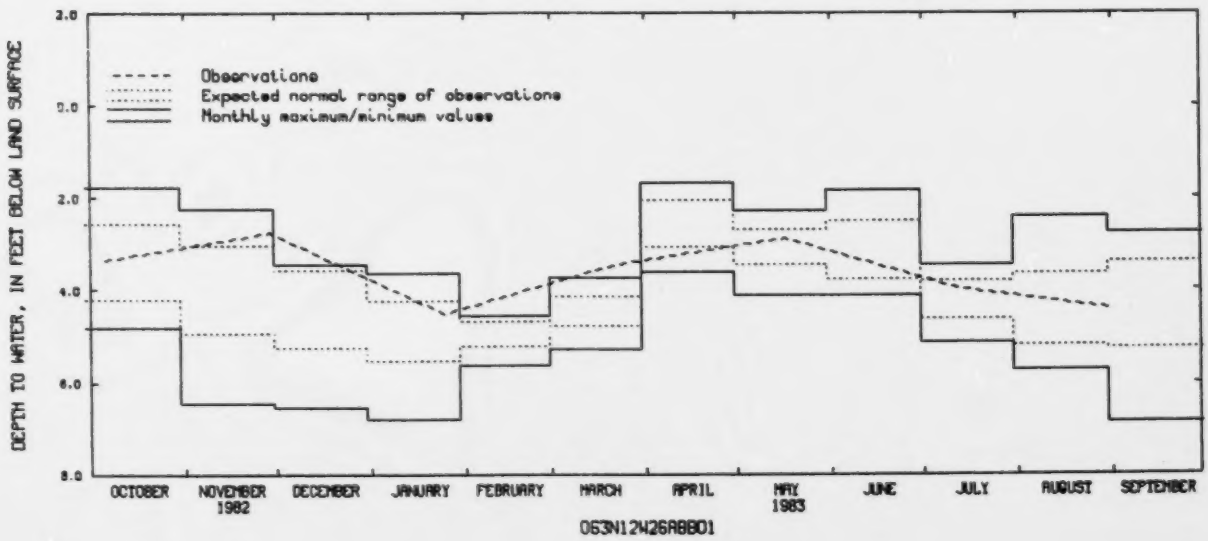
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	21.58	DEC 1	20.50	APR 1	21.04	JUN 30	21.37	AUG 1	21.46	SEP 1	21.13
NOV 1	21.54	JAN 1	20.38	MAY 1	21.12						

475502091494601. Local number, 063N12W26ABB01.
LOCATION.--Lat 47°55'02", long 91°49'46", in NW¼NW¼NE¼ sec.26, T.63 N., R.12 W., Hydrologic Unit 09030001, at Ely.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 9 ft (2.7 m), screened 7 to 9 ft (2.1 to 2.7 m).
DATUM.--Altitude of land-surface datum is 1,342 ft (409 m). Measuring point: Top of casing, 4.00 ft (1.22 m) above land-surface datum.
PERIOD OF RECORD.--October 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.68 ft (0.51 m) below land-surface datum, Apr. 20, 1982; lowest, 6.87 ft (2.09 m) below land-surface datum, Sept. 27, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 6	3.35	JAN 25	4.52	MAR 23	3.44	MAY 17	2.88	JUL 13	3.97	AUG 31	4.40
NOV 29	2.76										



BEST COPY AVAILABLE

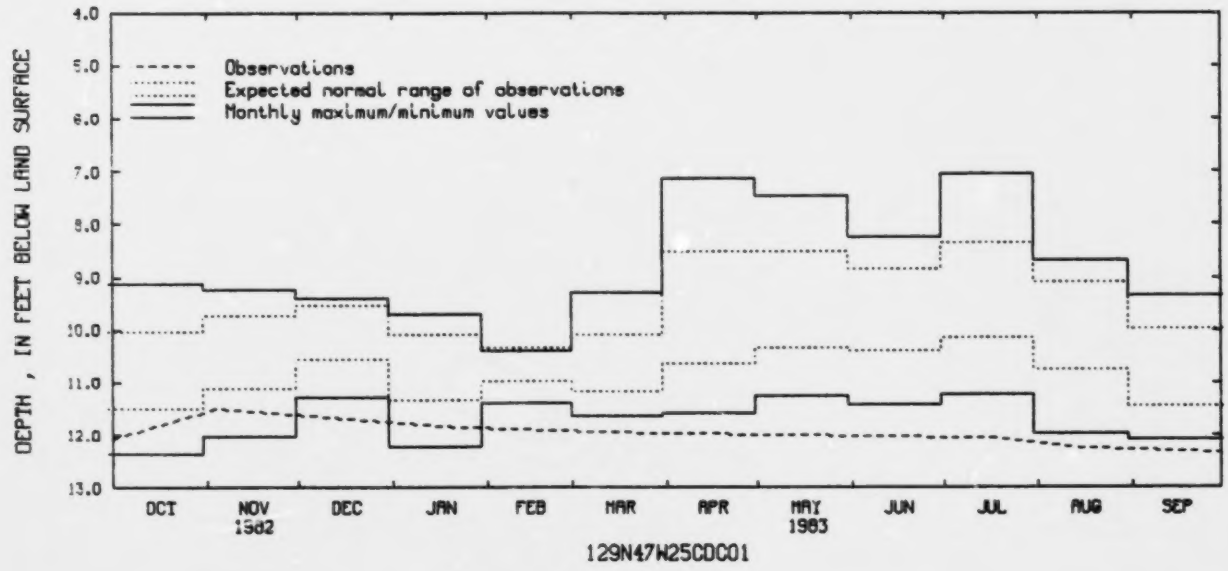
GROUND-WATER LEVELS

TRAVERSE COUNTY

455700096314001. Local number, 129N47W25CDC01.
LOCATION.--Lat 45°57'00", long 93°31'40", in SW¼SE¼SW¼ sec.25, T.129 N., R.47 W., Hydrologic Unit 09020101, 9 mi (14.5 km) north of Wheaton.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 39 ft (11.9 m), open end.
DATUM.--Altitude of land-surface datum is 1,010 ft (308 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--October 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.05 ft (2.15 m) below land-surface datum, July 14, 1978; lowest, 12.36 ft (3.77 m) below land-surface datum, Oct. 18, 1974.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 4	11.50	JAN 21	11.85	MAR 14	11.95	JUL 19	12.06	AUG 15	12.24



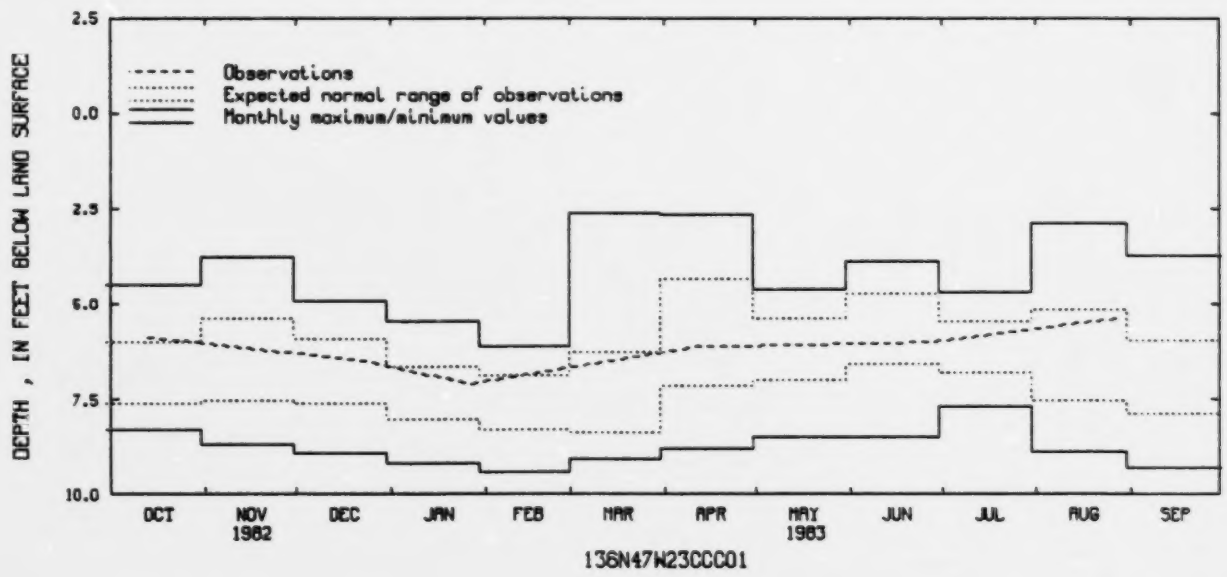
BEST COPY AVAILABLE

WILKIN COUNTY

463422096341701. Local number, 136N47W23CCC01.
LOCATION.--Lat 46°34'22", long 96°34'17", in SW¼SW¼SW¼ sec.23, T.136 N., R.47 W., Hydrologic Unit 09020106, 7.5 mi (12.1 km) east of Wolverton.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 62 ft (18.9 m), screened 58 to 62 ft (17.7 to 18.9 m).
DATUM.--Land-surface datum is 953.9 ft (290.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--October 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.61 ft (0.80 m) below land-surface datum, Mar. 21, 1966; lowest, 9.42 ft (2.87 m) below land-surface datum, Feb. 16, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	5.87	DEC 22	6.48	JAN 27	7.10	APR 11	6.13	JUN 28	6.00	AUG 28	5.38



BEST COPY AVAILABLE

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

CARLTON COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)
464008092351201	048N18W02DBC	400MDMR	83-08-31	--	1290.00	240	296	7.4	7.6
464018092314001	048N17W05CAB ROBERT LA F	112BRDO	83-08-31	--	1245.00	--	170	7.4	7.4
464020092405401	048N18W06BCC C027 PERCH	112OTSH	83-08-30	1400		--	85	89	6.4	6.1
464216092312501	049N17W29BAD UNIV MN FOR	112OTSH	83-08-30	--	1260.00	345	160	6.4	6.8
464242092292701	049N17W22CBC KEITH BASSE	112BRDO	83-08-30	1900	1282.00	--	210	6.9	7.8
464245092311901	049N17W20DBC CLAYTON BAS	400MDMR	83-08-30	1930	1272.00	--	220	7.1	8.0
464312092354201	049N18W23BBB C008 CHURCH	112OTSH	83-08-30	1200		--	105	124	6.4	6.9
464318092380501	049N18W21BBA ROLAND OLSO	112BRDO	83-08-30	1530	1380.00	--	333	6.6	7.7
464410092310001	C49N17W08DDC HOULE	112BRDO	83-08-31	--	1278.00	--	172	7.4	6.5
464417092321701	049N17W07DDC DALE CARLSO	400MDMR	83-08-31	--	1290.00	--	439	7.2	7.6

DATE OF SAMPLE	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TURBIDITY (NTU) (00076)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2) (00405)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)
83-08-31	--	1	3.0	29	12	17	.80	138	11	.8	13	.5
83-08-31	--	1	3.5	24	5.8	2.8	.60	72	5.5	11	1.5	.1
83-08-30	9.0	1	80	10	3.2	2.4	.50	29	22	13	2.2	<.1
83-08-30	8.0	2	31	21	5.5	16	1.1	39	30	16	11	<.1
83-08-30	--	1	1.0	27	7.8	2.9	.80	74	18	21	8.9	<.1
83-08-30	--	2	1.1	23	10	8.9	1.1	119	18	1.7	1.3	.4
83-08-30	11.0	1	34	14	5.1	4.3	1.1	55	42	11	3.5	<.1
83-08-30	--	2	<1.0	45	14	3.9	.80	156	76	23	1.4	.1
83-08-31	--	1	2.4	23	7.0	4.0	.60	92	7.1	2.1	.70	.2
83-08-31	--	1	1.5	44	22	5.9	1.1	170	21	11	11	.3

DATE OF SAMPLE	SILICA, DISSOLVED (MG/L AS SI02) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NITRATE DISSOLVED (MG/L AS N) (00618)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	ARSENIC TOTAL (UG/L AS AS) (01002)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA) (01007)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD) (01027)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	COPPER, TOTAL RECOVERABLE (UG/L AS CU) (01042)	IRON, TOTAL RECOVERABLE (UG/L AS FE) (01045)	LEAD, TOTAL RECOVERABLE (UG/L AS PB) (01051)
83-08-31	13	166	--	<.01	<.10	49	<100	1	20	3	330	6
83-08-31	20	115	1.10	<.01	1.10	3	100	1	20	13	130	4
83-08-30	19	75	.30	.02	.32	2	<100	9	20	27	24000	27
83-08-30	15	131	3.00	<.01	3.00	2	100	1	20	12	39000	60
83-08-30	15	123	.10	.01	.11	4	100	1	20	12	1600	5
83-08-30	14	130	--	.020	<.10	6	200	1	20	4	200	5
83-08-30	17	94	3.19	.010	3.20	1	<100	2	10	6	13000	7
83-08-30	21	199	.17	.010	.18	4	100	1	10	14	150	6
83-08-31	16	107	--	<.010	<.10	3	<100	1	10	4	440	4
83-08-31	16	251	--	<.010	<.10	2	<100	1	10	32	820	10

DATE OF SAMPLE	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN) (01055)	MERCURY TOTAL RECOVERABLE (UG/L AS HG) (71900)	SELENIUM, TOTAL (UG/L AS SE) (01147)	SILVER, TOTAL RECOVERABLE (UG/L AS AG) (01077)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN) (01092)
83-08-31	130	<.1	<1	<1	1200	1200
83-08-31	20	<.1	<1	<1	36	70
83-08-30	190	.4	<1	<1	29	7800
83-08-30	230	.2	<1	1	52	660
83-08-30	90	.4	1	<1	65	140
83-08-30	40	.4	<1	<1	160	30
83-08-30	200	.3	<1	<1	50	170
83-08-30	10	.4	<1	<1	51	100
83-08-31	60	<.1	<1	<1	74	370
83-08-31	20	<.1	<1	<1	70	450

BEST COPY AVAILABLE

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1982 TO SEPTEMBER 1983

OTTER TAIL COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)
462100095414501	133N40W11BCC01	112OTSH	83-06-15	1430	--	20.00	440	433	6.8
462715095323001	134N39W01ACD02	112OTSH	83-06-15	1330	--	60.00	540	514	6.7
463245095331501	136N39W35DAD02	112OTSH	83-06-15	1230	--	68.00	570	584	6.5
463500095331501	136N39W14DDD01	112OTSH	83-06-15	1130	--	40.00	530	534	6.7

DATE OF SAMPLE	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	NITROGEN, NITRATE DISSOLVED (MG/L AS N) (00618)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	IRON, DISSOLVED (UG/L AS FE) (01046)
83-06-15	7.5	10.0	59	5.4	5.80	5.80	10
83-06-15	7.2	9.5	78	9.7	--	<.10	6700
83-06-15	7.4	9.0	82	9.7	5.30	5.30	10
83-06-15	7.6	9.0	70	15	11.0	11.0	40

ST. LOUIS COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)
464925092353301	050N18W14BBA THERESA LAP	400MDMR	83-09-01	--	1315.00	--	405	7.2	7.6
464955092355201	050N18W10ADD RANDALL	112BRDO	83-09-01	--	1310.00	310	332	7.1	7.7
465122092371201	051N18W33DDD	400MDMR	83-09-01	--	1255.00	310	396	7.2	7.7
465125092364501	051N18W34DDA	112OTSH	83-09-01	--	1262.00	--	110	7.1	6.5

DATE OF SAMPLE	COLOR (PLATINUM-COBALT UNITS) (00080)	TURBIDITY (NTU) (00076)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	ALKALINITY LAB (MG/L AS CACO3) (90410)	CARBON DIOXIDE DISSOLVED (MG/L AS CO2) (00405)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)
83-09-01	1	4.4	35	17	30	2.5	224	27	.4	1.4	.5	11
83-09-01	6	1.6	30	16	16	.90	171	26	1.8	3.8	.3	17
83-09-01	2	<1.0	13	5.2	68	2.9	186	23	3.0	15	1.5	8.5
83-09-01	11	100	12	5.2	3.2	.60	48	7.4	10	2.4	.1	22

DATE OF SAMPLE	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	NITROGEN, NITRATE DISSOLVED (MG/L AS N) (00618)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	ARSENIC TOTAL (UG/L AS AS) (01002)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA) (01007)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD) (01027)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	COPPER, TOTAL RECOVERABLE (UG/L AS CU) (01042)	IRON, TOTAL RECOVERABLE (UG/L AS FE) (01045)	LEAD, TOTAL RECOVERABLE (UG/L AS PB) (01051)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN) (01055)
83-09-01	243	--	<.01	<.10	2	<100	1	10	4	1100	5	40
83-09-01	192	2.50	<.01	2.50	6	100	1	20	5	600	5	70
83-09-01	236	--	<.01	<.10	4	100	1	10	9	240	5	10
83-09-01	87	--	<.01	<.10	3	<100	1	20	10	40000	7	280

DATE OF SAMPLE	MERCURY TOTAL RECOVERABLE (UG/L AS HG) (71900)	SELENIUM, TOTAL (UG/L AS SE) (01147)	SILVER, TOTAL RECOVERABLE (UG/L AS AG) (01077)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN) (01092)
83-09-01	.1	<1	<1	540	240
83-09-01	<.1	<1	<1	180	280
83-09-01	<.1	<1	<1	260	380
83-09-01	<.1	<1	<1	36	2000

BEST COPY AVAILABLE

BEST COPY AVAILABLE

INDEX

	Page
Access to WATSTORE data	20
Accuracy of field data and computed results	18
Acre-foot, definition of	9
Adenosine Triphosphate, definition of	9
Algae, definition of	9
Algal growth potential, definition of	9
Analyses of samples collected at water-quality partial-record stations	146-162
Aquifer, definition of	9
Argyle, Middle River at	93,167
Artesian, definition of	9
Artificial substrate, definition of	13
Ash mass, definition of	9
Ash River at entrance to Sullivan Bay near Ray	150
Aurora, St. Louis River near	42,163
Bacteria, definition of	9
Bagley, Mosquito Creek near	140
Baptism River near Beaver Bay	31-36,163
Barnesville, Whiskey Creek at	140
Basswood River near Winton	114,168
Battle River, South Branch, at Northome	141
Baudette, Rapid River near	132,169
Beast Lake near International Falls	159
Beaver Bay, Baptism River near	31-36,163
Bed material, definition of	9
Bigfork, Big Fork River near	142
Big Falls, Big Fork River at	126,169
Big Fork River at Big Falls	126,169
near Bigfork	142
Big Lake near Sawyer	146
Biochemical oxygen demand, definition of	9
Biomass, definition of	9
Blackduck, Spring Creek near	141
Blackhoff, Rock Creek near	139
Rock Creek tributary near	139
Blue-green algae, definition of	12
Bois de Sioux River near White Rock, SD	61,165
Boriin Creek near Chisholm	142
Borup, South Branch Wild Rice River near	141
Bottom material, definition of	10
Bowerman Brook near Craigville	142
Brookston, Simian Creek near	46-47,164
Stoney Brook at	44-45,164
Buffalo River near Callaway	140
near Dilworth	71,165
near Hawley	69,165
South Branch, at Sabin	70,165
Bug Creek at Shaw	139
Bulldog Run near Warroad	142
Callaway, Buffalo River near	140
Caribou, Roseau River below State ditch 51, near	103-108,168
Caribou River near Little Marais	138
Cells/volume, definition of	10
Cfs-day, definition of	10
Chemical oxygen demand, definition of	10
Chisholm, Boriin Creek near	142
Sturgeon River near	120,169
Chlorophyll, definition of	10
Clearbrook, Silver Creek near	141
Clearwater River at Plummer	83,166
at Red Lake Falls	85,167
tributary near Plummer	141
Climax, Sand Hill River at	78,166
Cloquet, Otter Creek near	56-57,164
Squaw Creek near	48-49,164
Collection and computation of data, surface-water records	16
Collection and examination of data, water-quality records	19
Collection of the data, ground-water level records	20
Color, unit, definition of	10
Contents, definition of	10
Control, definition of	10
Cook, Little Fork River at	141
Coon Creek near Twin Valley	140
Cooperation	1
Craigville, Bowerman Brook near	142
Crane Lake, Little Trout Lake near	149
Lucille Lake near	148
Sandpoint Lake below Harrison Narrows near	147
Vermilion River near	117,168
Crookston, Red Lake River at	86-90,167
Cubic feet per second, definition of	10
Cubic feet per second per square mile, definition of	10
Data, accuracy of	18
ground-water level records, explanation of	20
other available	18
surface-water records, collection and computation of	16
water-quality records, collection and examination of	19
Deer Creek near Holyoke	58,164
Definition of terms	9
Diatoms, definition of	12
Dilworth, Buffalo River near	71,165
Discharge at, partial-record stations, and miscellaneous sites	134-145
High-flow partial-record stations	136-142
Low-flow investigations of streams tributary to Red River of the North	144-145
Low-flow partial-record stations	134-135
Miscellaneous sites	143
Discharge, definition of	10
Discontinued gaging stations	22-25
Dissolved, definition of	10
Diversity index, definition of	10
Downer, Spring Creek above	140
Downstream order and station number, definition of	15
Drainage area, definition of	10
Drainage basin, definition of	10
Drayton, ND, Red River of the North at	94-95
Dry mass, definition of	9
Duluth, Miller Creek at	138
Talmadge River at	138
East Branch Warroad River near Warroad	142
Eighteenmile Creek near Wheaton	140
Ely, Pilson Creek near	112,168
Kawishiwi River near	109-111,168
Emerson, Manitoba, Red River of the North at	96-98
Encampment River tributary at Silver Creek	138
Explanation of ground-water level records	20
of stage and water-discharge records	16
of water-quality records	19
Factors for converting Inch-Pound Units to International System (SI) Units	Inside back cover
Fairbanks, North Branch Whiteface River near	139
Fargo, ND, Red River of the North at	66-67
Red River of the North below	68
Fecal coliform bacteria, definition of	9
Fecal streptococci bacteria, definition of	9
Fergus Falls, Orwell Lake near	59
Otter Tail River below Orwell Dam, near	60,164
Filson Creek near Ely	112,168
Floodwood, Floodwood River above	139
Floodwood River above Floodwood	139
Forbes, St. Louis River at	43,163
Fort Frances, Ontario, Rainy Lake near	119
Gage height, definition of	10
Gaging-station, definition of	10
records	30-133
Gaging stations, discontinued	22-25
Gold Portage outlet from Kabetogama Lake near Ray	118,168
Gonvick, Ruffy Brook near	141
Goodridge, Red Lake River at High Landing near	81,166
Graceville, West Branch Mustinka River tributary near	139
Grand Forks, ND, Red River of the North at	91-92

BEST COPY AVAILABLE

INDEX

	Page
Grand Portage, Pigeon River at Middle Falls near	30,163
Grygla, Mud River near	141
Green algae, definition of	12
Ground-water, level data, by county	174-195
in hydrologic conditions	2
quality data, by county	196-197
Halstad, Red River of the North at	74-76
Hardness of water, definition of	11
Hawley, Buffalo River near	69,165
Hendrum, Wild Rice River at	73,165
Hickson, ND, Red River of the North at	64-65
High-flow partial-record stations	136-142
Holyoke, Deer Creek near	58,164
Nemadji River near	139
South Fork Nemadji River near	139
Hoyt Lakes, Partridge River above Colby Lake at	38-41,163
Hydrologic benchmark station, definition of	16
Hydrologic conditions	2
graphs of	3-8
ground-water levels	2
precipitation and streamflow	2
water quality	2
Hydrologic unit, definition of	11
Introduction	1
Instantaneous discharge, definition of	10
International Falls, Beast Lake near	159
Jorgens Lake near	156
Little Shoepack Lake near	157
Namakan Lake above Kettle Falls near	158
Peary Lake near	160
Rainy Lake at Black Bay near	161
Rainy Lake at Brule Narrows near	162
Jorgens Lake near International Falls	156
Kabetogama Lake at mouth of Meadwood Bay near Ray	152
at Sullivan Bay outlet near Ray	151
in Lost Bay near Ray	155
near Ray	154
Kawishiwi River near Ely	109-111,168
near Winton	113,168
Knife River near Two Harbors	37,163
Lac la Croix, Ontario, Namakan River at outlet of	115,168
Lake Bronson, South Branch Two Rivers at	142
Lakes and Reservoirs:	
Beast Lake near International Falls	159
Big Lake near Sawyer	146
Jorgens Lake near International Falls	156
Kabetogama Lake at Sullivan Bay outlet near Ray	151
at mouth of Meadwood Bay near Ray	152
in Lost Bay near Ray	155
near Ray	154
Lake of the Woods at Warroad	133
Little Shoepack Lake near International Falls	156
Little Trout Lake near Crane Lake	149
Lower Red Lake near Red Lake	79
Lucille Lake near Crane Lake	148
Namakan Lake above Kettle Falls near International Falls	158
near Ray	153
Orwell Lake near Fergus Falls	59
Peary Lake near International Falls	160
Rainy Lake at Black Bay near International Falls	161
Sandpoint Lake below Harrison Narrows near Crane Lake	147
Vermilion Lake near Soudan	116
Lake of the Woods at Warroad	133
Lake of the Woods basin, gaging-station records in	109-133
high-flow partial-record stations in	136-142
low-flow partial-record stations in	134-135
Lake Superior, streams tributary to, high-flow partial-record stations	136-142
streams tributary to, gaging-station records	30-58
List of gaging-stations, in downstream order, for which records are published	VI-VII
List of counties for which ground-water-level records are published	VII
Little Fork River at Cook	142
at Littlefork	121-125,169
Littlefork, Little Fork River at	121-125,169
Little Marais, Caribou River near	138
Little Shoepack Lake near International Falls	157
Little Stewart River near Two Harbors	138
Little Trout Lake near Crane Lake	149
Lost River at Oklee	84,167
Lower Red Lake near Red Lake	79
Low-flow investigations of streams tributary to the Red River of the North	144-145
Low-flow partial-record stations	134-135
Lutsen, Poplar River at	158
Mahnomen, Marsh Creek tributary near	140
Malung, Roseau River below South Fork, near	99,167
Manitou Rapids, Rainy River at	127-131,169
Map of Minnesota ground-water observation wells	172-173
high-flow partial-record stations	136-137
water-discharge stations	26-27
water-quality stations	28-29
Marsh Creek tributary near Mahnomen	140
Marsh River near Shelly	77,166
Mean concentration, definition of	13
Mean discharge, definition of	10
Measurements at miscellaneous sites	143
Metamorphic stage, definition of	11
Methylene blue active substance, definition of	11
Micrograms per gram, definition of	11
Micrograms per kilogram, definition of	11
Micrograms per liter, definition of	11
Middle River at Argyle	93,167
near Newfolden	142
Miller Creek at Duluth	138
Milligrams of carbon per area or volume per unit time, definition of	12
Milligrams of oxygen per area or volume per unit time, definition of	12
Milligrams per liter, definition of	11
Miscellaneous analyses of streams in Minnesota, water-quality data at streamflow stations	163-169
Miscellaneous sites, discharge measurements at	143
numbering system for	15
Mosquito Creek near Bagley	140
Mud River near Grygla	141
Mustinka River, West Branch, tributary near Graceville	139
Namakan Lake above Kettle Falls near International Falls	158
near Ray	153
Namakan River at outlet of Lac la Croix Ontario	115,168
Nashaua, Rabbit River near	140
National Geodetic Vertical Datum of 1929 (NGVD), definition of	11
National stream-quality accounting network (NASQAN), definition of	16
Natural substrate, definition of	13
Nemadji River near Holyoke	139
Nemadji River, South Fork, near Holyoke	139
Newfolden, Middle River near	142
North Branch Whiteface River near Fairbanks	139
Northome, South Branch Battle River at	141
Numbering system for wells and miscellaneous sites	15
Ogema, Spring Creek tributary near	141
Oklee, Lost River at	84,167
Organic mass, definition of	9
Organism, definition of	11
count/area, definition of	11
count/volume, definition of	11
Orwell Lake near Fergus Falls	59
Other data available	18
Otter Creek near Cloquet	56-47,164
Otter Tail River below Orwell Dam, near Fergus Falls	60,164
Parameter code numbers	11
Partial-record station, definition of	11
discharge at	134-145
water quality at	146-162
Particle-size classification, definition of	11
Particle-size, definition of	11

BEST COPY AVAILABLE

INDEX

	Page
Partridge River above Colby Lake, at Hoyt Lakes	38-41,163
Peary Lake near International Falls	160
Percent composition, definition of	12
Periphyton, definition of	12
Perry Creek tributary near Shooks	141
Pesticides, definition of	12
Pesticide program, definition of	16
Phytoplankton, definition of	12
Picocurie, definition of	12
Pigeon River at Middle Falls, near Grand Portage	30,163
Plankton, definition of	12
Plummer, Clearwater River at	83,166
Clearwater River tributary near	141
Polychlorinated biphenyls, definition of	12
Poplar River at Lutsen	138
Precipitation and streamflow	2
Primary productivity, definition of	12
Publications on techniques of water-resources investigations	21
Rabbit River near Nashaua	140
Radiochemical program, definition of	16
Rainy Lake at Black Bay near International Falls	161
at Brule Narrows near International Falls	162
near Fort Frances, Ontario	119
Rainy River at Manitou Rapids	127-131,169
Rapid River near Baudette	132,169
Ray, Ash River at entrance to Sullivan Bay near	150
Gold Portage outlet from Kabetogama Lake near	118,168
Kabetogama Lake at Sullivan Bay outlet near	151
Kabetogama Lake at mouth of Meadwood Bay near	152
Kabetogama Lake in Lost Bay near	155
Kabetogama Lake near	154
Namakan Lake near	153
Records of discharge collected by agencies other than the Geological Survey	18
Recoverable from bottom material, definition of	12
Red Lake, Lower Red Lake near	79
Red Lake River near	80,166
Red Lake Falls, Clearwater River at	85,167
Red Lake River at Crookston	86-90,167
at High Landing, near Goodridge	81,166
near Red Lake	80,166
Red River of the North at Drayton, ND	94-95
at Emerson, Manitoba	96-98
at Fargo, ND	66-67
at Grand Forks, ND	91-92
at Halstad	74-76
at Hickson, ND	64-65
at Wahpeton, ND	62-63
below Fargo, ND	68
Red River of the North basin, high-flow partial-record stations in	138-142
gaging-station records in	59-108
low-flow investigations of streams tributary to	144-145
low-flow partial-record stations in	135
miscellaneous measurements in	143
Reservoir (see lakes and reservoirs)	
Rock Creek near Blackhoof	139
tributary near Blackhoof	139
Roseau Lake, Roseau River at	101
Roseau River at Roseau Lake	101
at Ross	102,167
below Roseau	100,143
below State ditch 51, near Caribou	103-108,168
below South Fork, near Malung	99,167
near Roseau	143
Roseau, Roseau River below	100,143
Roseau River near	143
Ross, Roseau River at	102,167
Ruffy Brook near Gonvick	141
Runoff in inches, definition of	13
Sabin, South Branch Buffalo River at	70,165
St. Louis River at Forbes	43,163
at Scanlon	50-55,164
near Aurora	42,163
Sand Hill River at Climax	78,166
Sandpoint Lake below Harrison Narrows near Crane Lake	147
Sawyer, Big Lake near	146
Scanlon, St. Louis River at	50-55,164
Sediment, definition of	13
explanation of	19
Shaw, Bug Creek at	139
Shelly, Marsh River near	77,166
Shooks, Perry Creek tributary near	141
Silver Creek, Encampment River tributary at	138
Silver Creek near Clearbrook	141
tributary near Two Harbors	138
Simian Creek near Brookston	46-47,164
Snake River at Warren	143
Solute, definition of	13
Soudan, Vermilion Lake near	116
South Branch Battle River at Northome	141
South Branch Buffalo River at Sabin	70,165
South Branch Two Rivers at Lake Bronson	142
South Branch Wild Rice River near Borup	141
South Fork Nemadji River near Holyoke	139
Special networks and programs	16
Specific conductance, definition of	13
Specific conductance and temperature at streamflow stations	163-169
Spring Creek above Downer	140
Spring Creek near Blackduck	141
tributary near Ogema	141
Squaw Creek near Cloquet	48-49,164
Stage-discharge relation, definition of	13
Stage and water-discharge data, accuracy of	18
collection and computation of	16
explanation of	16
other available	18
Station numbers, explanation of	15
Stoney Brook at Brookston	44-45,164
Streamflow, definition of	13
in hydrologic conditions	2
Streams tributary to Lake Superior high-flow partial-record stations in	136-142
gaging-station records in	30-58
Sturgeon River near Chisholm	120,169
Substrate, definition of	13
Surface area, definition of	13
Surface-water data, accuracy of	18
collection and computation of da	16
other available	18
Surficial bed material, definition of	13
Suspended, definition of	13
Suspended recoverable, definition of	14
Suspended total, definition of	14
Suspended sediment, definition of	13
Suspended-sediment concentration, definition of	13
Suspended-sediment discharge, definition of	13
Suspended-sediment load, definition of	13
Talmadge River at Duluth	138
Taxonomy, definition of	14
Terms, definition of	9
Thief River near Thief River Falls	82,166
Thief River Falls, Thief River near	82,166
Time-weighted average, definition of	14
Tons per acre-foot, definition of	14
Tons per day, definition of	14
Total, definition of	14
Total in bottom material, definition of	14
Total coliform bacteria, definition of	9
Total load, definition of	14
Total organism count, definition of	11
Total recoverable, definition of	14
Total sediment discharge, definition of	13
Tritium network, definition of	15
Twin Valley, Coon Creek near	140
Wild Rice River at	72,165
Wild Rice River tributary near	140
Two Harbors, Knife River near	37,163
Little Stewart River near	138
Silver Creek tributary near	138
Two Rivers, South Branch, at Lake Bronson	142
Vermilion Lake near Soudan	116
Vermilion River near Crane Lake	117,168
Voyageurs National Park, water-quality partial-record stations	146-162
Ash River at entrance to Sullivan Bay near Ray	150
Kabetogama Lake at Sullivan Bay outlet near Ray	151
at mouth of Meadwood Bay near Ray	152
in Lost Bay near Ray	155
near Ray	154

BEST COPY AVAILABLE

INDEX

	Page
Voyageurs National Park--Continued	
Namakan Lake above Kettle Falls near International Falls	158
near Ray	153
Rainy Lake at Black Bay near International Falls	161
at Brule Narrows near International Falls	162
Sandpoint Lake below Harrison Narrows near Crane Lake	147
Wahpeton, ND, Red River of the North at	62-63
Warren, Snake River at	143
Warroad, Bulldog Run near	142
East Branch Warroad River near	142
Lake of the Woods at	133
Warroad River, East Branch near Warroad	142
Water-quality records, analyses of samples collected at ground-water wells	196-197
at partial-record stations	146-162
collection and examination of	19
explanation of	19
in hydrologic conditions	2
miscellaneous analyses at streamflow stations	163-169
sediment	19
water analysis	19
water temperature	19
Weighted average, definition of	15
Well number, definition of	15
West Branch Mustinka River tributary near Graceville	139
Wet mass, definition of	10
Wheaton, Eighteen Mile Creek near	140
Whiskey Creek at Barnesville	140
Whiteface River, North Branch, near Fairbanks	139
White Rock, SD, Bois de Sioux River near	61,165
Wild Rice River at Hendrum	73,165
at Twin Valley	72,165
South Branch, near Borup	141
tributary near Twin Valley	140
Winton, Basswood River near	114,168
Kawishiwi River near	113,168
WDR, definition of	15
WRD, definition of	15
WSP, definition of	15
Zooplankton, definition of	12

☆ U.S. GOVERNMENT PRINTING OFFICE:1985—565-930

BEST COPY AVAILABLE

October 1, 1978

FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI). This report contains both the inch-pound and SI unit equivalents in the station manuscript descriptions.

Multiply inch-pound units	By	To obtain SI units
	Length	
inches (in)	2.54×10^{1}	millimeters (mm)
	2.54×10^{-2}	meters (m)
feet (ft)	3.048×10^{-1}	meters (m)
miles (mi)	1.609×10^{0}	kilometers (km)
	Area	
acres	4.047×10^{3}	square meters (m^2)
	4.047×10^{-1}	square hectometers (hm^2)
	4.047×10^{-3}	square kilometers (km^2)
square miles (mi^2)	2.590×10^{0}	square kilometers (km^2)
	Volume	
gallons (gal)	3.785×10^{0}	liters (L)
	3.785×10^{0}	cubic decimeters (dm^3)
	3.785×10^{-3}	cubic meters (m^3)
million gallons	3.785×10^{3}	cubic meters (m^3)
	3.785×10^{-3}	cubic hectometers (hm^3)
cubic feet (ft^3)	2.832×10^{1}	cubic decimeters (dm^3)
	2.832×10^{-2}	cubic meters (m^3)
cfs-days	2.447×10^{3}	cubic meters (m^3)
	2.447×10^{-3}	cubic hectometers (hm^3)
acre-feet (acre-ft)	1.233×10^{3}	cubic meters (m^3)
	1.233×10^{-3}	cubic hectometers (hm^3)
	1.233×10^{-6}	cubic kilometers (km^3)
	Flow	
cubic feet per second (ft^3/s)	2.832×10^{1}	liters per second (L/s)
	2.832×10^{1}	cubic decimeters per second (dm^3/s)
	2.832×10^{-2}	cubic meters per second (m^3/s)
gallons per minute (gal/min)	6.309×10^{-2}	liters per second (L/s)
	6.309×10^{-2}	cubic decimeters per second (dm^3/s)
	6.309×10^{-5}	cubic meters per second (m^3/s)
million gallons per day	4.381×10^{1}	cubic decimeters per second (dm^3/s)
	4.381×10^{-2}	cubic meters per second (m^3/s)
	Mass	
tons (short)	9.072×10^{-1}	megagrams (Mg) or metric tons

BEST COPY AVAILABLE